**Reviewing University Community Gardens for Sustainability: Taking stock, comparisons with urban community gardens, and mapping research opportunities**

Rebecca Laycock1 and Dr Zoe Robinson1

1 School of Geography, Geology and the Environment, Keele University, Keele, UK

Rebecca Laycock (corresponding author)  
William Smith Building  
Keele University  
Staffordshire  
ST5 5BG  
UK  
Email: r.laycock@keele.ac.uk  
Tel: +44 (0) 1782 734993

Dr Zoe Robinson  
William Smith Building  
Keele University   
Staffordshire   
ST5 5BG  
UK  
Email.  z.p.robinson@keele.ac.uk   
Tel: +44 (0)1782 734303Reviewing University Community Gardens for Sustainability: Taking stock, comparisons with urban community gardens, and mapping research opportunities

Community gardens in university settings are faced with challenges associated with a transient and inexperienced population of student gardeners, but they also have the potential to have a lasting impact on the food behaviours of many young people. This paper undertakes a systematic critical review of literature about University Community Gardens for Sustainability (UCGS) in order to suggest directions of future research in the emerging field research about community gardens within and outside of universities. The literature shows that UCGS have similar benefits to those identified in urban community garden literature; but with greater emphasis on both the educational and environmental sustainability benefits, suggesting an under-used potential of Community Gardens in these areas. We argue that a better understanding of the particular challenges and benefits of UCGS could improve outcomes of community gardens in all settings. Therefore we recommend that future should explore: (1) participant transience in community gardens, thereby helping sustainability projects with large volunteer bases learn to cope with challenges this poses in order to maximize the garden’s impacts; (2) whether/how participating in community gardens can contribute to changes in attitudes/behaviours with regards to sustainability and be used as a tool for Education for Sustainability in and outside of university settings; and (3) failed cases of community gardens to genuinely understand factors that contribute to success. By addressing these areas we can improve our understanding of how community gardening can contribute to our communities, universities, and environment, and can begin to make these potential contributions a reality.

Keywords: Education for Sustainability, failure, higher education, transience, volunteers, urban agriculture

**Introduction**

Community gardens, “open spaces managed and operated by members of the local community in which food, flowers” and/or other plants are cultivated (Holland 2004, Pudup 2008, Kingsley et al. 2009, Guitart et al. 2012, p. 364), have been linked to building community, making fresh food accessible, improving health, providing economic benefits to their users, increasing biodiversity, and contributing to self- and collective-efficacy (the belief in one’s capabilities or a group’s capabilities to take action on a given problem) (Pierce and Seals 2006, Teig et al. 2009, Evans et al. 2012, Guitart et al. 2012). In these spaces, both direct impacts (like increasing local biodiversity) and indirect impacts (like education and community networking) to communities and the environment can be made (Evers and Hodgson 2011).

Community gardens that are affiliated with Higher Education Institutions (HEIs) are a part of this movement that have developed more recently and are experiencing growth (Barlett 2011). Part of this growth in University-based community growing projects stems from an increased interest in enhancing the sustainability of universities and the potential of these garden projects to influence the sustainability attitudes and behaviours of their students, society’s future leaders (McKinne and Halfacre 2007; Johnston et al. 2012). Many universities are striving to encourage sustainability through their campus environment and food system (such as those documented by Sharp (2002), Baldwin and Chung (2007), Rojas et al. (2007), and Barlett (2011)), and others are taking advantage of the opportunities to link these endeavours to the formal curriculum (such as those documented by Rojas et al. (2007), Babich and Smith (2010), Bacon et al. (2010), and Cohen (2010)). Sustainability leadership in Higher Education (HE) therefore also has the ability to contribute to transformative change in the food system through fostering cultural transformations and “[reshaping] relations between food and place” (Bartlett 2011, p. 101). This can be achieved in a university setting by encouraging sustainable food habits though promotional material, providing space for food growing initiatives, and demonstrating a commitment to socially and environmentally ethical procurement. Institutional commitments to sustainable procurement can make a sizable impact on the “conventional food chain” as well, since universities are such large consumers (Bartlett 2011, p. 101, 111).

One issue that can negatively affect community growing schemes is that of participant transience (McKinne and Halfacre 2007), which create a variety of challenges. ‘Participant transience’ is the phenomenon of a predictable, high turnover rate (the rate of departure and replacement) of people involved in a project or initiative. University Community Gardens for Sustainability (UCGS) (community gardens that have a commitment to sustainability through practice and/or ethos and are associated with a university) are important to study as they exemplify ‘participant transience’ because of their predictable turnover of students. Other places that experience high levels of participant transience include areas with large populations of migrant workers, homeless and domestic violence shelters, prisons, and schools. Therefore research into university growing schemes can also provide insights into the management of growing schemes in these other communities as well, as well as other volunteer initiatives with high participant transience. Furthermore, UCGS involve people at a unique point in their lives when they have just moved from home and may be developing habits that stay with them through their lives (Verplanken et al. 2008, Thompson et al. 2011, van Niekerk and Barnard 2011). Because of this, the students’ skills, knowledge, and perceptions on their ability to contribute to positive changes that are developed throughout their university experience may have longer-lasting effects than those experiences of participants in other types of community gardens (Thompson et al. 2011). It is therefore important to maximise the learning potential of the university food growing experience.

The purpose of this article is to identify what unique findings the literature about UCGS has contributed and has the potential to contribute to the existing conversations being had about community gardens, urban agriculture, sustainable food, Education for Sustainability (EfS), and management of voluntary organisations. Given the potential impact that UCGS could have on sustainability attitudes and behaviours of future graduates, it is important to understand their effectiveness at achieving these aims and how they could be improved. In order to do this, we undertook a systematic critical review of UCGS using a methodological framework established by Guitart et al. (2012) in their review of urban community gardens. In this review we map current trends in research in this new and evolving area in order to identify priorities for future research and to collate research in a way which can be utilised to improve the outcomes of food-related growing projects in HEIs.

**Methodology**

A systematic literature review was undertaken, producing a quantitative synthesis of the literature about UCGS to map current patterns and direct future research efforts (Petticrew and Roberts 2006). Systematic critical reviews are an approach to reviewing literature that identify, appraise and synthesise all primary literature on a subject. They have been used widely in the social sciences, and increasingly in environmental and sustainability studies (as in Fleith de Medeiros et al. (2013) and Terstappen et al. (2013)). This style of review is beneficial for mapping trends in the literature, highlighting reliable findings and uncovering biases, and is a “reproducible, reliable [assessment] of the current status of a field of research” (Petticrew and Roberts 2006; Guitart et al. 2012, p. 365). By appraising the literature using a transparent and clearly articulated methodology, there is reduced potential for authorial bias compared to narrative-style reviews (Guitart et al. 2012). Some of the limitations of the method are that the reliability of the review is dependent on the quality and scope of articles analysed, and there is a certain amount of subjectivity in developing inclusion criteria for studies included in the review and identifying themes in diverse literature (Garg et al. 2008).

Given that literature about growing projects in universities is an emerging area, a systematic literature review was an appropriate method to take stock of what has been written to date to guide future research efforts. Because Guitart et al. (2012) have already developed a robust set of themes found in the literature about community gardens, this paper uses and builds upon their thematic framework to reduce subjectivity in identifying themes.

***Inclusion Criteria***

All gardens in the articles that were included in this review were *University Community Gardens for Sustainability* (UCGS)*.* Guitart et al’s. (2012) review only included literature which referred to gardens specifically as ‘community gardens’. We could not use this as a criterion, as many of the limited number of papers about food-growing initiatives at HEIs did not refer to their growing initiatives as ‘community gardens.’ Therefore we developed three criteria for inclusion in the review: the gardens (1) were affiliated to a HEI, (2), were community gardens, in terms of being operated and managed by the local community (including university students, staff, alumni, and residents, as well as people living in the area surrounding the university or garden), and (3) had a commitment to sustainability through practice and/or ethos (the latter was included given the need to explore the capacity for university community gardens to contribute to pro-environmental attitude and behaviour change). Specific descriptions about what these criteria include, as well as examples of gardens that have been excluded and included based on these criteria can be seen in Table 1 and 2.

Articles, such as reports or other accounts, which were not peer-reviewed (such as Lund and Orth (2010)) were not included in the review, though were used as background information to give context to the review. The types of peer reviewed articles included conference proceedings, feature articles, technical papers, perspective pieces, and research articles.

***Method***

Articles were found searching through the following electronic databases: EBSCO, ISI Web of Knowledge, and Google Scholar. This was done from June 2013 to August 2016. Some of the keywords used to find the articles were ‘university,’ ‘community garden,’ ‘food growing,’ ‘campus,’ ‘higher education,’ and ‘sustainability.’ Further articles were found by exploring the references of the initial papers and other literature reviews, as well as those papers which had cited Guitart et al.’s (2012)review.

Each article was coded according to its authors’ affiliation(s), journal’s discipline area, year of publication, location of the garden(s) studied, research methods used, garden characteristics, and benefits of the gardens (Guitart et al. 2012). The garden characteristics were then broken down into types of gardens (e.g., food gardens, farms, botanical gardens), what plants were grown (e.g. edible, medicinal, ornamental), whether or not produce was sold and who it was sold to, who participated in the garden (e.g. students, faculty, paid staff), and if the garden was used in the formal curriculum, and if so, for what subject area.

The benefits (both those that were discussed and those that were demonstrated) that the garden provided were categorised using the themes identified by Guitart et al. (2012). *Discussed benefits* were “only mentioned as the authors’ opinion and/or findings in previous literature”, while *demonstrated benefits* “were confirmed as a result of the research” (Guitart et al. 2012, p. 365). The themes were: ‘social benefits’ (which were benefits to a group of people, such as networking, engaging diverse groups of people, and community development); ‘access to fresh foods’; ‘economic benefits’; ‘health benefits’; ‘reduced crime/increased safety’; ‘educational benefits’; ‘environmental sustainability benefits’ (such as the use of sustainable or organic farming or gardening methods); ‘cultural heritage/development’; ‘life satisfaction’[[1]](#footnote-1); ‘environmental equity’ (a state when a particular group or community does not bear disproportionate negative environmental effects or impacts), and ‘increased biodiversity’[[2]](#footnote-2). For this review we have developed three new categories of benefits that did not fit under any of the themes identified by Guitart et al. (2012). These are: ‘engagement, attitudes and behaviours for sustainability’; ‘additional benefits to individual participants’[[3]](#footnote-3); and ‘benefits to the institution’.

**Comparing the Literature about UCGS and Urban Community Gardens**

## Characteristics of articles and gardens researched

There were twenty-two articles reviewed, covering twenty-three gardens (one of the articles reviewed wrote about two gardens). The majority (81%) of the articles about UCGS were written by authors affiliated with institutions in the USA, much like those about urban community gardens (61%). The articles about UCGS were published in journals about horticulture (36%), education (36%), health (14%), non-profit/social marketing (9%), and sustainability (5%). The 36% of the articles in journals about horticulture were published in a single journal, with several coming from a special issue. The types of journals publishing articles about urban community gardens were “geography (28%), environment and planning (24%), society and culture (23%), health (12%), education (9%), economics (3%) and conservation biology (1%)” journals (Guitart et al., 2012, p. 366). All of the articles about UCGS were written since 1999, with most written between 2005 and 2012, while articles about urban community gardens reviewed by Guitart et al. (2012) were published between 1985 and 2011, with most being published since 2000. Only eight (36%) of the articles about UCGS reported the methods they used, seven of which used qualitative methodologies/methods, including case studies, Participatory Action Research, narrative evaluation, autoethnography, interviews, participant observation, and document reviews. The other study that described its methods was a mixed-methods experimental study using questionnaires. Most of the articles about urban community gardens used a qualitative approach or mixed methods (most using interviews, surveys, text analysis, focus groups, case studies and participant observation), and the remaining five studies used quantitative data (Guitart et al. 2012).

Most (78%) of the UCGS were located in the USA and nearly half took the form of food gardens (48%), with a number of farms (13%), Community Supported Agriculture (a model of agriculture in which consumers share the economic risks with the producers by paying for their share of produce at the beginning of the season; sometimes consumers volunteer with the garden or farming tasks) (13%), botanical gardens (13%), and a wildlife habitat garden, native plant garden, and allotment. This mirrors the literature reviewed by Guitart et al. (2012) which included some larger-scale projects (Wade 1987, Karaan and Mohamed 1998), projects involving restoration ecology/native ecosystem regeneration (Stocker and Barnett 1998), and those run for commercial purposes (Flynn 2001). In the UCGS literature, students were the most commonly reported participants (reported by 87% of gardens), followed by faculty (academic staff) (56%), paid interns or garden managers (35%), community members (26%) and organisations (21%). Most (74%) of the UCGS grew edible plants, but ornamental plants (22%), native/endangered species (17%), wildlife-habitat-enhancing plants (9%), and medicinal plants (9%) were also grown. Over a third (39%) of the UCGS were reported to sell produce, and it was most often sold to the campus community or through a campus food outlet. Over two-thirds (68%) of the UCGS were used in the formal curriculum in a wide variety of disciplines, with the most common ones being agriculture/horticulture, applied studies/projects, education, and environmental subjects/geography. Figure 1 illustrates the number of UCGS embedded in the formal curriculum of different disciplinary areas. Types of participants and plants grown, as well as the number of gardens selling produce and embedded in educational curricula in the literature about urban community gardens was not reported by Giutart et al. (2012).

## Benefits of UCGS and urban community gardens

Because the study of community gardens is an emerging area, much of the research that has been done has explored what the benefits of such projects are. We have identified and compared the reported benefits of UCGS and urban community gardens in order to evaluate their contributions to a sustainable environment and society. However, we also identified the potentially important benefits that are under-explored and -evaluated so further research can provide a more complete understanding of what UCGS, and community gardens in general, have to offer a sustainable environment and society. All the benefits of urban community gardens identified by Guitart et al. (2012) were discussed and/or demonstrated in the literature about UCGS. The proportion of articles discussing each of these benefits in the bodies of literature about UCGS and urban community gardens are illustrated in Figure 2a and 2b.

Educational and social benefits, additional benefits to individual participants and to the university were the benefits that were most discussed and demonstrated in articles about UCGS, while social benefits, access to fresh foods, health benefits, and economic benefits were discussed and demonstrated most in articles about urban community gardens. The rest of this section expands on the social, economic, educational, environmental sustainability, and cultural heritage/development benefits, as well as additional benefits to the individual participants and benefits to the university, benefits associated with accessing fresh foods, and engagement, attitudes and behaviours for sustainability. Benefits to health, life satisfaction, environmental equity, reduced crime/increased safety and biodiversity are not discussed further because their coverage is very similar in articles about both UCGS and urban community gardens, and apart from health benefits they were only reported by discussed and/or demonstrated by one or two articles each.

*Social* benefits were *demonstrated* in fourteen (68%) of the articles about UCGS. The proportion of articles about UCGS with demonstrated social benefits was more consistent with the amount of articles it was *discussed* in (72%), as compared to the articles about urban community gardens with 60% discussing, but only 38% demonstrating it. The social benefits written about in the UCGS articles included: increased interdisciplinary and faculty-student interaction, establishing a supportive ‘community’ around a specific issue (ie. sustainable food, health promotion), connecting food consumers with growers, the sharing of ideas and experiences, cross-cultural communication, fostering a sense of civic engagement, and developing trust and caring among gardeners. A number of the articles mentioned how the social interaction in the garden spurred action beyond the garden, such as participants going on to take courses for their career development, and supporting each other in cases of illness and death in the family. See Table 3 for the articles that cite these benefits.

*Access to fresh food* was discussed in ten (45%), and demonstrated in six (27%) of the articles about UCGS. Several of the articles mentioned that the gardens collaborated with university food services to serve the garden’s produce (Ross 2005, Biernbaum et al. 2006, Wharton and Harmon 2009, Kobayashi et al. 2010). One article mentioned that their CSA may contribute to an emergency food system (Wharton and Harmon 2009), while others mentioned that gardens can contribute to local food production (Biernbaum et al. 2006), and growing and gathering traditional food (Mundel and Chapman 2010). Guitart et al. (2012) didn’t look for access to fresh food as a discussed benefit in their review, but they reported it as a demonstrated benefit in 43% of the articles about urban community gardens. This discrepancy between the number of UCGS and urban community gardens demonstrating access to fresh food may be because, while a number of the articles about UCGS implied (but did not explicitly state) that access to fresh foods was a benefit, we chose not to count these articles as demonstrating access to fresh foods. On the other hand, Guitart et al. (2012) wrote that they “assumed that [access to fresh foods] was a demonstrated benefit” (p. 386), indicating that articles that were not explicit about this benefit may have still been counted, accounting for this discrepancy in the *demonstrated* access to fresh food between the reviews.

*Economic benefits* were discussed in a greater proportion of articles about urban community gardens (42%) than in those about UCGS (27%), however they were demonstrated in a similar proportion (17% in urban community gardens and 14% in UCGS). In their articles about UCGS, Kobayashi et al. (2010) mentioned the use of a self-sustaining business model, and Wharton and Harmon (2009) said that their CSA distributed economic risk between the farmers and consumers. These economic benefits differ to the ones mentioned by Guitart et al. (2012), who described economic benefits that were more participant-centred, such as individuals saving or making money. These participant-centred economic benefits were not mentioned in the articles about UCGS.

Not unexpectedly, *educational benefits* were found to be a key outcome of UCGS. These were discussed in all but one of the articles, while fourteen articles demonstrated it (73%). This is in contrast to only 34% of articles about urban community gardens that discussed and 13% that demonstrated educational benefits. Some of the different aspects of education mentioned in the articles about UCGS were the development of skills, inter-/multi-disciplinary education, science, sustainability, and environmental education, and improved outcomes of academic work (see Table 4). Some articles mentioned the role of the UCGS in linking formal and informal learning, changing participants’ attitudes towards ‘education,’ and increasing their agency in their own education through using more informal methods (such as experiential learning and using the garden as an outdoor classroom), thereby enabling participants to take a more active role in their education, in effect, ‘learning how to learn’. Many of these are educational approaches that are consistent with Education for Sustainability (EfS; also known as Education for Sustainable Development (ESD)), “the process of equipping students with the knowledge and understanding, skills and attributes needed to work and live in a way that safeguards environmental, social and economic wellbeing, both in the present and for future generations” (QAA 2014), and the Freirean tradition of critical pedagogy (which has had a strong influence on EfS), in which the role of the teacher is as facilitator, and the student is encouraged to think critically and take ownership of their learning (Freire 2000). This highlights that there is a much under-used potential for greater educational benefits in the informal learning spaces of urban community gardens. It is also apparent that UCGS are beginning to play an increasing and important role in the EfS agenda in universities. Given that education is an international priority for moving towards a sustainable society (UNCED 1992, Wals 2012), strategies are needed for embedding sustainability in Higher Education (HE), and EfS outside of formal educational institutions. UCGS and other types of community gardens can contribute to this activity.

Several articles also mentioned cultural aspects of education related to the UCGS. For example, Shan and Walter (2015) say that one of the gardens they investigated enabled learning that fostered “knowing, connecting, and hybrid knowledge production across cultures” (in their case, between ‘westerners’ and Chinese immigrants) (p. 19). Mundel and Chapman (2010, p.172) also mentioned how non-aboriginal students participating in a garden used for aboriginal health promotion provided the students with insight into “challenges facing colonized people”. The importance of such cultural exchanges and learning will vary between gardens, but the articles highlight the potential of these spaces for cultural understanding. However, it should also be noted that gardens are not *de facto* intercultural educational spaces – cultural and racial tensions from other aspects of society can be replicated in the garden environment (Mundel and Chapman 2010).

*Environmental sustainability* was a discussed benefit in twelve (55%) of the articles about UCGS. This is much more than the 22% of articles reported to have discussed environmental sustainability in Guitart’s (2012) study of urban community gardens, an expected result given that the inclusion criteria for this review included sustainability (see Table 1 and 2). However, the disparity in numbers of discussed and demonstrated benefits in articles about urban community gardens is consistent with the fact that 27% of articles about UCGS (elaborated on below) and only 2% of articles about urban community gardens demonstratedenvironmental sustainability (Stocker and Barnett 1998; Holland 2004). The most commonly mentioned contribution to environmental sustainability in the articles about UCGS was the use of organic farming or gardening methods, but other gardens were improving environmental conditions in other ways, such as through ecological restoration (Hockenberry Meyer et al. 2010), bioremediation (Hockenberry Meyer et al. 2010), and growing endangered plant species (Lewis and Affolter 1999).

One of the challenges faced while identifying the themes from the articles was determining what constitutes environmental sustainability in community gardens. We decided that environmental sustainability benefits excluded those that may have been caused by reported dietary changes (ie. the displacement of unsustainable food products in participants’ or other benefactors’ diets by food produced more sustainably in the garden) because the links between dietary changes and environmental sustainability is too complex to know whether or not it actually has contributed to environmental sustainability without doing a lifecycle analysis of the food. Although there is clearly potential for environmental sustainability benefits from community gardens, the literature is limited particularly in terms of demonstrating these benefits, probably because it can be difficult to demonstrate these benefits.

Guitart et al. (2012) suggest that two main questions need to be addressed in order to establish whether food growing projects can be considered ‘sustainable’. These are (1) ‘What do gardens grow?’ to explore agro-biodiversity, and (2) ‘How is the food grown?’ to explore “the sustainability of gardening practices” (Guitart et al. 2012, p. 369). Recently there have been some innovative attempts to demonstrate the benefits in these two areas. For example, Guitart et al. (2014, 2015) have assessed the agrobiodiversity in community gardens by exploring the types of food planted using a colour-classification system, and have investigated gardening practices used in community gardens and their ecological integrity. Silva and Krasny (2014) have also suggested that open-access online tools for measuring impacts and outcomes of community gardens should be used (such as Farming Concrete’s Data Collection Toolkit (Design Trust for Public Space n.d), as well as practitioner-researcher partnerships for more in depth investigations into the environmental sustainability benefits of these gardens.

*Cultural heritage/development* benefits were discussed in six (27%) articles about UCGS, with five (23%) demonstrating these. Cultural heritage benefits[[4]](#footnote-4) were discussed in 18% of the articles about urban community gardens and demonstrated in 7%. The term ‘cultural heritage’ implies “racial and ethnic boundaries [are frozen] in time” (Shan and Walter, 2015, p. 2), whereas, in reality, culture is dynamic and changing. We chose to adapt Guitart et al.’s (2012) category, calling it cultural heritage/development to account for ongoing changes in culture.

Some of the benefits associated with cultural heritage/development in UCGS included using traditional methods and techniques of growing, cooking and eating associated with a particular culture and/or time period (Lewis and Affolter 1999, Mundel and Chapman 2010), accessing culturally appropriate food not available in supermarkets (Somerset et al. 2010), re-establishing and developing traditions and identities of migrants (Shan and Walter 2015), sharing memories and stories of Aboriginal people (Phillips 2011), and reducing ethnic tensions (Hoffman et al. 2007, Datta 2016). Guitart et al. (2012, p. 368) found that most of the research about urban community gardens was about gardens in “low income earning areas with different cultural backgrounds in industrial cities in the USA”. There was much less written about the class of the participants in the literature about UCGS (likely due in large part to the fact that most of the gardens are located on university campuses), though seven articles mentioned involving participants of varying cultural backgrounds.

*Additional individual benefits to participants* were discussed in thirteen (59%) articles about UCGS, and were demonstrated in nine (41%). These benefits were those that were of benefit to an individual and were additional to those included in Guitart et al’s. (2012) study. The benefits cited included skill development, professional development and mentoring, decreased food shopping trips, the enjoyment of contact with nature and food growing, academic improvement, and developing a sense of place (see Table 5). Although Guitart et al. (2012) did not include these benefits explicitly, they may have characterized some similar benefits as those associated with ‘life satisfaction’.

Thirteen (59%) of the articles about UCGS discussed *benefits to the university*, and the same number of these also demonstrated the benefits. These benefits included research outputs (which were mentioned in eleven (50%) of the articles). Other benefits included increasing student engagement/involvement with the university (Apul and Philpott 2011), outreach (such as inviting people or groups from the community on the campus to see the food growing initiative) (Falk et al. 2005, Biernbaum et al. 2006, Markhart 2006, McKinne and Halfacre 2008, Wharton and Harmon 2009, Somerset et al. 2010), teaching (McKinne and Halfacre 2008), and improved appearance of the campus (Hoffman et al. 2007). Though Guitart et al’s. (2012) research involved several university-based projects or projects aligned with universities, they made up a very small proportion of the articles reviewed, and therefore they did not identify this category of benefits.

*Engagement, attitudes and behaviours for sustainability* were discussed in eleven (50%) and demonstrated in six (27%) UCGS articles. They mentioned how volunteering in a garden can deepen the participants’ relationship with food and the environment (Wharton and Harmon 2009, Wills et al. 2009, Mundel and Chapman 2010, Phillips 2011). They also mentioned that the gardening can also promote an interest in (Wagner & Fones 1999), a sense of responsibility for (Johnston et al. 2012), and even a “dedication for fighting for” the natural world (Apul & Philpott 2011, p.70). These weren’t reported by Guitart et al. (2012), possibly because Guitart and her colleagues did not include sustainability explicitly as an inclusion criterion. It is also possible that these benefits may have been written in the articles reviewed by Guitart et al. (2012), but were included within one of the other categories of benefits. This latter suggestion seems likely since two of the UCGS articles mentioning engagement, attitudes and behaviour towards sustainability (Wills et al. 2009, Mundel and Chapman 2012) were also reviewed by Guitart et al. (2012). Attitudes and behaviours for sustainability will be discussed further in the following section about literature gaps.

Many of the benefits produced by urban community gardens that Guitart et al. (2012) identified align with those identified in this review of UCGS. However, there were different emphases between the two areas of literature on which benefits were important, and additional benefits identified in the UCGS literature. An example of the former was that educational benefits were unsurprisingly more apparent in the literature on UCGS. The similarity in the range of benefits identified in both reviews suggests that these might provide a useful framework in reviewing the efficacy of community gardening projects in a range of different settings. This could be supported by the development of tools (such as Farming Concrete’s (2014) Data Collection Toolkit) to measure and track food production, as well as environmental, social, health, and economic benefits in farms and gardens.

**Literature Gaps**

This review of the literature of University Community Gardens for Sustainability and its comparison to Guitart et al’s. (2012) review of urban community gardens has highlighted the discussed and demonstrated benefits of these initiatives and has alluded to some of the gaps in the literature. Some of these are that the research in this field is heavily US-centric, and approached mainly using qualitative approaches. This therefore means that literature may not fully represent the breadth of experiences of these community garden initiatives, and does not maximise on the learning possible from different disciplinary perspectives. However, there are also key gaps in the literature relating to: (1) a lack of examples of ‘failure’ of community gardens, (2) under-exploration of participant transience in community gardens and (3) how UCGS and urban community gardens contribute to changes in sustainability attitudes and behaviours. These will be expanded upon in this section.

***‘Failure’ in Community Gardens***

Failure of community gardening projects is under-explored in the literature. In the literature review of urban community gardens by Guitart et al. (2012, p. 368), only five in eighty-seven papers described negative outcomes and these “were all related to insecure land tenure and gardens being demolished for future development”. There were also some mixed and neutral outcomes, but the overwhelming majority of articles described positive outcomes (Guitart et al. 2012). Similarly, only positive cases were discussed in the UCGS literature.

It is important to study failure because when we only study positive examples, we can misunderstand what is genuinely making them successful (Denrell 2003). This is because commonalities between successful cases can be assumed to contribute to their success when in reality they may be coincidental, and those commonalities may equally feature in examples of failure. Only through exploring both positive and negative examples can we see what factors contribute to success.

Publication bias against papers with negative outcomes is a well-documented, however unresolved, phenomenon in medical (Easterbrook et al. 1991) and social sciences (Franco et al. 2014). It is clearly an issue in community gardening literature as well, as demonstrated by the lack of discussion of failed projects in the papers included in this review, even though there are many failed community garden projects in both urban and university settings. Some of the reasons this may have taken place are “reviewer or editor preferences” and authors’ anticipation of “the rejection of negative outcomes” (Easterbrook et al. 1991, Lee et al. 2012, p. 10). To reviewers, editors and authors, positive examples may be perceived as more useful to know about so they can be replicated. Furthermore, authors may prefer to write about their successes rather than their failures for promotional purposes, or because they are more likely to write about projects they have positive feelings about. On the other hand, researchers interested in studying examples of failure may struggle to find information about failed projects because the projects may have collapsed before they came to fruition making it difficult to identify individuals involved, or people associated with the project may not want to revisit their failures.

There is also a time-lag associated with publishing negative or statistically insignificant findings because researchers may prioritise their positive findings (Ioannidis, 1998). Even though results may eventually be published, delays can also force researchers and practitioners to rely on positive findings for up-to-date information.

This being said, researchers need to be careful not to focus on ‘good’ or ‘bad’ dichotomies. Rather it is more productive to critically probe the cases and problematize practice in order to contribute to nuanced and transformative understandings. Corcoran et al. (2004) have argued that many case studies published about sustainability in HE are written as success stories (or as they call them, ‘make-your-case-studies’) and have a “‘policing function’ that identifies good [cases] from bad” (Cocoran et al. 2004, p. 18). Literature about community gardening and UCGS is at risk of falling into this trap. In order for research about community gardens to contribute to new knowledge that can improve the efficacy of these initiatives, the gap in the literature about ‘failure’ needs to be addressed.

***Participant Transience***

As the most commonly reported participants of UCGS are students, participant transience is a key part of understanding UCGS management. UCGS projects experience two primary participant transience issues. Firstly, students are usually only present at the university during term time (missing the most labour intensive and agriculturally productive season for food growing), and secondly, students are only at the university for a limited number of years, with the number depending on their programme of study. This has significant bearing on how the gardens are maintained because students are usually only at university for the less agriculturally productive part of the year, but gardens need to be tended year-round. Maintaining volunteer interest in community gardens can be a challenge, given that the fruits of labour in the garden often come weeks, months, or even years after the effort. In the case of UCGS, involvement of key individuals and organisations (ie. estate and grounds staff) can also be a challenge because volunteers who are only involved in the short term may not know who the best people or groups are to help with projects in the garden. For example, summer caretaker presence and community interest may be difficult to establish and maintain when student volunteers don’t know appropriate staff, postgraduate students, or community members to approach (McKinne and Halfacre 2008). Knowledge management (creating, using, sharing, and retaining information effectively) is also a challenge associated with participant transience and is important for contributing to organisational learning (the integration of new knowledge to improve an organisation) (Ragsdell 2007, 2013), and may be important just to keep an initiative going. This is particularly important for community gardens, given that gardening is such a knowledge-intensive activity (Brush 2007).

Adrangi (2013) also found that students can also unintentionally neglect work by other local groups on similar projects (such as by initiating new projects (like community gardens, food bank donations, etc.) without realizing such projects have already been lobbied for or run by/in affiliation with the university or within the local community), and duplicating efforts thereby creating tensions between non-students and students. However, this neglect of existing work also deprives students and their projects of “a pool of knowledge and mentors, exposure to new ways of doing things and experiences, pooled human and material resources, and staying power that often exceeds” their own (Adrangi 2013).

While participant transience is clearly a defining factor of UCGS, it is an issue that has not been adequately explored. And indeed, while participant transience is a key challenge in UCGS settings, it is also a challenge faced by other community gardens, given that *ad hoc*, one-time, and seasonal volunteering is on the rise (MacDuff 2005). Understanding participant transience and its relationship to project continuity and environmental and social outcomes is important given the increasing number of community gardens and amount of resourcing for these projects. A better understanding of participant transience could also help sustainability and community projects with large volunteer bases outside of university settings to learn how to improve their projects.

***Attitude and Behaviour Change***

Guitart et al. (2012) did not identify attitude or behaviour change as a benefit of community garden projects (although this maybe be included implicitly under the ‘social benefits’ category). However, a variety of studies have been conducted about how community gardens impact attitude and/or behaviour change with regard to the environment and participants’ food choices (Somerset and Markwell 2009, Turner 2011). The results are mixed, and the reason may be, as Middlemiss (2011) found, that different participants may be affected in different ways. She found that “those who are new to sustainability and who are actively involved in cohesive groups, which are specifically targeting their lifestyles, are more likely to report substantial changes” in sustainable lifestyle behaviours than those with histories of engagement in sustainable lifestyles or behaviours (Middlemiss, 2011, p. 265). Therefore the capacity of growing projects to contribute to enhancing pro-environmental behaviour is contingent on (1) recruiting participants not already active in sustainability or environmentalism, and (2) the cohesiveness, as well as the beliefs, behaviours and attitudes of the group.

The implications of this for UCGS are related to the transience of their participants. Because UCGS experience such high turnover of participants, a need for ongoing recruitment is one of their central features. This could result in engaging many participants without a history of sustainability or environmental engagement who would be more prone to attitude or behaviour change. However, the high turnover could also impact the cohesiveness of the group, providing fewer opportunities for social learning. It could also be difficult to engage those who are not already interested in sustainability.

Several of the food growing UCGS in the reviewed articles aimed to enable participants to develop healthy, ethical, and eco-friendly attitudes and behaviours towards food. For example, Wharton and Harmon (2009, p. 114) said that CSA membership “allows members to deepen their relationship and involvement with food” by decreasing “the number of shopping trips to more conventional venues such as the supermarket.” Members may also change their food behaviours (such as choosing to eat together as a family or experimenting “with the art of composting”) because of the lack of pre-sliced, -washed, and -packaged foods provided to them (Wharton and Harmon, 2009, p. 114). In a number of the articles, the aim to change attitudes and behaviour related to sustainable food was implicit – for example, several of the reviewed articles (Falk et al. 2005, Parr and Van Horn 2006, Wharton and Harmon 2009, Datta 2016) said the UCGSs they wrote about aimed to provide educational opportunities about sustainable food systems, and such education may lead to changes in sustainable food attitudes and behaviours (such as by engaging “students as consumers” (Kobayashi et al. 2010, p. 503)).

It has been theorised that there are particular windows of time (sometimes called ‘life-course transitions’ (Elder 1998, Schäfer et al. 2011)) in a person’s life when they can be particularly able to make changes to otherwise inflexible habits (Verplanken et al. 2008). An example of one of these windows is when young people move from their parental home and begin shopping for and cooking their food independently for the first time. This notion has been used to justify a variety of university sustainability initiatives, including a national food growing initiative for Further and Higher Education Institutions run by the National Union of Students in the UK, called Student Eats, which aims to facilitate these changes around sustainable food by setting up community gardens these institutions.

There is also evidence that volunteering in a university community garden can improve self-esteem and self-efficacy (the belief in one’s capabilities to take action on a given problem) (Pierce and Seals 2006, Hoffman et al. 2007, Teig et al. 2009, Evans et al. 2012). Given that a lack of self-efficacy has been shown to be a barrier to changing sustainability-related behaviours (such as recycling), it may be possible that this is also the same for ethical and eco-friendly food behaviours – which community gardens could address. This is echoed by DeLind (2006) who suggests that local initiatives that can connect to people emotionally, sensually, and expressively, like community gardens, “may best promote long-term attitudinal and behavioural change in relation to food” (Turner 2011, p. 513). Improved self-efficacy through food growing projects may also increase self-efficacy in other areas of a person’s life, increasing their ability to make wider, positive changes for themselves, their communities, and the environment.

However, there are a variety of other mitigating factors influencing pro-environmental behaviours that have yet to be considered. Firstly, the impact of pro-environmental behaviour change initiatives needs to be reflected on in relation to infrastructural factors and barriers (in the case of sustainable food habits, whether there are growing spaces, food waste and composting facilities, good access to markets and shops with sustainable food options, etc.). This also ties in with ethical considerations behind attempting to address student’s attitudes and behaviours related to sustainable food. While it may seem commendable, it is also paternalistic in assuming that the participants are not already conscious of their attitudes and have not already attempted to address their unsustainable behaviours, which may be prevented by mitigating factors and infrastructural barriers.

Secondly, while students may develop sustainable habits while at university, the change from student life to working life may actually be another ‘moment of change’. This ‘moment of change’ could ‘undo’ all the habits developed at university, so it is equally as important to study how partaking in initiatives like UCGSs impact behaviours beyond their participants’ time at university to understand the longevity of the initiatives’ impacts. Thompson et al. (2011) have conducted a limited number of interviews which explored the potential for university-based sustainability initiatives to contribute to behaviour change and found that while there are already many existing behaviour change initiatives in universities throughout the UK and that they have a lot of potential given that students are a captive audience, there is little evidence of the impact these actually have on behaviour change. This therefore is an area requiring significant further research. Longitudinal studies spanning pre-university to post-university life would be particularly appropriate for understanding the impact of UCGS beyond the university, as has been done in other studies on life course transitions (Elder 1998).

**Conclusion**

UCGS and urban community garden literature are similar in terms of the geographical scope of the authorship and gardens they investigated (USA-centric), and the majority of the types of benefits reported to result from the gardens. The benefits reported most frequently for both urban community gardens and UCGS include social, educational, economic, and health, as well as benefits associated with accessing fresh food. They depart in terms of their focus on educational benefits (with a much higher proportion articles about UCGS discussing and demonstrating them), and the proportion of articles citing environmental sustainability benefits (with a higher proportion articles about UCGS both discussing and demonstrating them). Based on this, we have suggested that community gardens are being used, and likely have an increasing potential to be used, as a tool for EfS at universities and in communities. There is also a need for further research into the impact of community gardens on environmental sustainability to find out more about this relationship.

We have also argued that there are three key literature gaps in literature about community gardens that need to be addressed. Without a better understanding of failed cases of community gardens we cannot substantiate claims about effective management and contribute to new knowledge that can input into the efficacy of these initiatives. We also need to better understand participant transience in community gardens (particularly UCGS) to help sustainability projects with large volunteer bases learn how to cope with the challenges participant transience poses. Finally, given that some articles suggest that participating in UCGS can contribute to changes in attitudes/behaviours with regards to sustainability, research is needed to explore this phenomenon in more depth, particularly in terms of the mechanisms which facilitate or hinder these changes, and whether these changes extend beyond university life or the time spent working on a community garden initiative. By addressing these gaps we will have better understanding of how community gardening can contribute to a more sustainable future and can begin to make these potential contributions a reality.

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Table 1. Criteria for the University Community Gardens for Sustainability (UCGS) written about in articles to be included in the critical systematic literature review.

Table 2. The differences and similarities between the inclusion criteria for this review about University Community Gardens for Sustainability (UCGS) and Guitart et al.’s (2012) inclusion criteria for their review of urban community gardens.

Figure 1. Number of University Community Gardens for Sustainability (UCGS) in the reviewed articles embedded in formal curricula of different disciplinary areas.

Figure 2a. The percentage of discussed and demonstrated benefits in articles about University Community Gardens for Sustainability (UCGS) (n=22). The benefits below the line were three new categories of benefits that were developed for this review as they did not fit under any of the themes identified by Guitart et al. (2012).  
\*Environmental sustainability benefits exclude benefits that may have been caused by dietary changes (ie. the displacement of unsustainable food products in participants’ or other benefactors’ diets by food from the garden). This was discussed in several of the articles; however, we felt that while it could be considered both an environmental sustainability benefit and a benefit in terms of providing access to fresh foods, the category that best captured it was ‘access to fresh foods’.

Figure 2b. The percentage of discussed and demonstrated benefits in articles about urban community gardens as assessed by Guitart et al. (2012) (n=87). The benefits below the line were three new categories of benefits that were developed for this review as they did not fit under any of the themes identified by Guitart et al. (2012).

Table 3. The types of social benefits identified in the literature about University Community Gardens for Sustainability (UCGS) and the articles reporting them.

Table 4. The types of educational benefits identified in the literature about University Community Gardens for Sustainability (UCGS) and the articles reporting them.

Table 5. The types of addition benefits to individual participants identified in the literature about University Community Gardens for Sustainability (UCGS) and the articles reporting them. While a number of benefits identified by Guitart et al. (2012) could fall under the ‘additional benefits to individual participants’ category (such as Education, Life satisfaction, etc.), the authors retained Guitart et al.’s existing categories, with other benefits to individual participants being captured in this category to enable clarity in comparing the findings.

1. Guitart et al. (2012) didn’t define what they meant by ‘life satisfaction,’ so we categorised benefits that enhanced participants’ sense of well-being (such as a ‘slower pace of life’ and improved self-confidence/esteem and/or empowerment) under this category. [↑](#footnote-ref-1)
2. Although it could be argued that Guitart et al.’s (2012) ‘increased biodiversity’ theme fit under ‘environmental sustainability,’ it is retained as a separate category to better align with Guitart et al.’s review. [↑](#footnote-ref-2)
3. While a number of benefits identified by Guitart et al. (2012) could fall under the ‘additional benefits to individual participants’ category (such as education, life satisfaction, etc.), we retained Guitart et al.’s existing categories, and added a new category called ‘additional benefits to individual participants’ (such as employability benefits and decreased shopping trips) for the benefits that didn’t fit under any other of Guitart et al.’s categories to enable clarity in comparing the findings. [↑](#footnote-ref-3)
4. This term was not defined by Guitart et al. (2012). [↑](#footnote-ref-4)