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# Bottom-up visions for future of food growing in cities

**ABSTRACT**

*We report on community food growing as an instance of practice-based sustainability research focused on the design of interactive systems for food growing in future cities. We present a case study with a series of workshops using speculative and participatory design approaches focused on creatively exploring futures of urban food growing with a local neighbourhood community. Working with local grassroots communities is often perceived as more egalitarian for promoting viable long-term and embedded change in cities, yet little work has studied this approach for urban food growing. To explore how we might better articulate and conceptualize collaborative food growing futures, we discuss the creation of bottom-up visions as contestations to hegemonic narratives of power and control in cities. These are affected by, limitations of present resources and infrastructures, inability to work at scale due to lack of buy-in of stakeholders, and erroneous promises of future technologies. Through these reflections on grassroots futures as complex assemblages of social and material realities, we provoke researchers and practitioners to look at envisioning future possibilities with participants, as a web of practices and stakeholders. We further suggest that researchers and practitioners explore*

**KEYWORDS**

sustainability  
speculative design  
participatory design  
urban food growing  
future cities  
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bottom-up futures  
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*these interconnections through assemblages of socio-material realities and visions of high- and low-tech futures. This work is important because it provides a new approach to looking at the design of future technologies for cities and addressing systemic issues of hegemonic food systems through bottom-up actionable futures.*

## INTRODUCTION

This work is situated within the fields of human–computer interaction (HCI) and interaction design. These fields look at how we can design digital technologies through human perspective and experience. Sustainability-minded researchers in this field have been increasingly interested in exploring how neo-liberal capitalism might feed the current ecological crisis. Researchers engaging with ecological unsustainability have argued that ecological crisis is a manifestation of unsustainable systems which are social, economic and political in nature (Dourish 2010). These intermingled systems entail the creation of social norms, values and institutions that are slow to change, making it difficult to imagine sustainable outcomes in the long-term (Knowles et al. 2018). To look at these ethical, political, social and ecological concerns closely, designers have called for a relook at design (Papanek and Fuller 1972), through the practices of ‘design futuring’ (Fry 2009), where designers set out to create ideas and ideals about the future through socially and politically engaged dialogues (Maz é 2013). Therefore, researchers have recognized design as a field and its importance in overcoming an unsustainable world and looking at climate change as a ‘defuturing phenomenon’ (Fry 2009), a mode of designing/acting in the world that can help mitigate against ways of living that limit our potential futures.

Sustainability has been a big concern in the production and consumption of food. However, when looking at visions for future cities and related technologies, food and sustainability is not a predominant concern (DiSalvo 2017; Thomas et al. 2016). In these future visions, food is still to be grown outside the cities and transported for long distances to reach city residents or is grown in hi-tech environments, which are unsustainable due to their resource- and energy-intensive nature. These visions concerned with the future of food production and consumption are predominantly dictated by the rhetoric of efficiency, growth and innovation. These are governed by technological solutionism (Meadows and Kouw 2017; Mullins 2017) which foresees technology as a solution to all problems. This thinking can miss out on using sustainability as a design value or the consideration of citizen perspectives (Vanolo 2016; Thomas et al. 2016). Local grassroots communities are vehicles of citizen voices and movements in creating bottom-up change (Gui and Nardi 2015; Massung et al. 2013).

Researchers have considered speculative and critical design practices to look at sustainability, e.g. by creating alternate futures and perspectives through provocations (Wakkary et al. 2013; Biggs and Desjardins 2020; Clarke et al. 2018; Pargman et al. 2017). Within the field of HCI, design futuring (Kozubaev et al. 2020) encapsulates speculative design and associated practices to challenges capitalist market pressures by favouring emancipatory design practices (Dunne and Raby 2013) and addressing big societal challenges by creating and considering alternative futures. Therefore, we are looking at addressing issues of sustainability through long-term thinking, which is inherently interlinked to temporality and the ideas of futuring (Maz é 2019).

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With built-in participatory, egalitarian structures in the research, we challenge singular hegemonic narratives of future cities and promote grassroots values (Heitlinger et al. 2019).

This work looks at urban food growing as part of sustainably designing future cities; how we source food, particularly how we grow local food, is important, and we can engender positive change through grassroots action and everyday practices (Heitlinger et al. 2013; Lyle et al. 2014). Prior research in community food growing has predominantly focused on limitations faced by communities (Gui and Nardi 2015; Biørn-Hansen and Håkansson 2018; Barr and Pollard 2017; Lampinen et al. 2019), supporting collaborative acts of growing (Lyle et al. 2015; Norton et al. 2019) and presenting them as political frictions to hegemonic narratives (Blevis and Morse 2009; Heitlinger et al. 2019). However, various competing agendas and needs from different stakeholders in the food systems can be disempowering for such grassroots local communities. Envisioning futures with such communities is vital in empowering them to create possibilities for change and for transitioning towards sustainable food systems (DuPuis and Goodman 2005; McPhearson et al. 2016). Thus, in our research, we inquire:

1. How do grassroots urban food-growing communities collectively conceptualize futures?
2. What are the considerations for researchers and designers for developing socio-technological systems linked to food growing in future cities?

To respond to these challenges and opportunities, we worked with a grassroots community involved in urban food growing to understand the future landscapes of food growing and the role of technological tools in enabling sustainable urban futures. This article reports on a series of research through design (RtD) workshops, using speculative and participatory approaches highlighting conflicts in urban food growing. We discuss the creation of bottom-up visions as contestations to hegemonic narratives of power and control in cities by understanding how limitations regarding present resources and infrastructure affect futures; from the lack of buy-in from influential stakeholders to the design of future technology concepts and their promises. We conclude by reflecting on how these grassroots food-growing futures are assemblages of social and material realities that should be addressed while redesigning visions for cities and future technologies. We propose to approach these by addressing contestations of values, the interplay of scale and stakeholders, and ideas of high- and low-technology futures for food growing in local communities to create autonomy and sovereignty.

## **BACKGROUND**

### ***Speculative design and applications***

We want the discipline of design to be seen as a normative act, a futuring discipline and a practice that changes existing situations into preferred ones (Simon 1969: 130), and yet trying to create a diversion from the status quo (Haylock 2018). Speculative and critical design-related methods prioritize critical imaginations about social and technical advancement over pragmatic problem solving (Dunne and Raby 2001). For example, in the development of future scenarios and artefacts these methods provoke reflection in citizens within the future world imagined or the future use of artefacts. Speculative

design, a design method that encourages addressing big societal problems by creatively looking at the future to create alternatives, has risen in significance within interaction design and HCI over the past decade. Designers and researchers who advocate for the value of speculation embrace a vast array of techniques and topics. Core elements of speculative design include the materialization of particular future worlds through film, theatre, radio, imagery, scenarios, exhibitions, installations and artefacts (Bendor et al. 2017; Briggs et al. 2012; Blythe et al. 2015; Wakkary et al. 2015; Candy and Dunagan 2017; Elsdén et al. 2017; Dolejšova 2018; Baumann et al. 2017). As a multifaceted future-oriented approach, methods can extend expansive visions of multiple possible near and far futures, provoking fears and desires alongside embodied and visceral future visions that can disrupt perceptions of everyday realities (Candy 2010). These evocative representations can further encourage political discussion across established and emerging publics on the often ill-conceived consequences of technology use in broader society, through experiential presentation formats.

Speculative practices are increasingly being operationalized across a range of different disciplines to prepare for the consequences of an increasingly devastated environment (Wakkary et al. 2013; Heitlinger et al. 2019; Clarke et al. 2018; Biggs and Desjardins 2020). Reflecting on studies of sustainability through design for longitudinal timescales (Blevis et al. 2017; Knowles et al. 2018) is becoming remarkably prescient for many urban communities due to the ever-increasing threats presented by climate change and growing urban populations (Light et al. 2017). Albeit there is an increased recognition that, for longer-term environmental change, visions of urban futures should not only be developed by experts, but with active involvement from urban communities (Rozendaal et al. 2016; Baumann et al. 2017; Gerber 2018, Chopra 2019). Urban communities that are anticipated to be most affected by climate change are in a better-informed position than designers to articulate and imagine a more environmentally sustainable future for themselves. Longitudinal local knowledge can contribute key insights within the speculative process, bringing forward an appreciation of place, intersecting histories and fragile ecosystems (Tran O'Leary et al. 2019). Additionally, recent work in design and across the social sciences have suggested greater potential in understanding acts of speculation more broadly as material (Wakkary et al. 2015; Dolejšova 2018). Dolejšova (2018) uses food as a material for speculating about futures of food and technologies of food production. Also, Heitlinger et al. highlight the need for situated speculations (Desjardins et al. 2019; Heitlinger et al. 2019), which can be essential in looking at sustainability at a local level. Participatory approaches in speculation (Lyckvi et al. 2018; Light 2015) are also gaining traction to look at the co-creation of futures, creating instances that allow for momentary imaginative events (Halewood 2017) for people to imagine together. Here, speculation is conceived of as quite literally grounded in the everyday experiential and material realities of people's lives (Candy 2010), but offering potential in creating experiments in new perspectives and individual and collective transformations (Marres 2017). Halewood reconceptualizes speculation as a situated and imaginative practice, modestly changing what is perceived to be possible in their lived and felt worlds (Halewood 2017). Therefore, suggesting a more egalitarian way of configuring its potential, allows for a more grounded focus on socio-material imaginative leaps and moves away from the pressures of expert-led knowledge.

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## ***Dominant visions for food growing futures: Policy, market and sustainability***

Food systems are seen as a constellation of activities involved in producing, processing, transporting and consuming food. Food and food systems have been a matter of concern by policy-makers, governments and related bodies. The recent UN Food Systems Summit (2021) acknowledges that, 'we all must work together to transform the way the world produces, consumes and thinks about food' (United Nations 2021). These policy perspectives, representing top-down approaches, also acknowledge the role of local, small-scale players but give little importance to the need for urban food growing and related constituents. Urban sustainability as a national and global agenda is approached through eco-cities and sustainable smart cities (Mullins 2017) through problem-solution framings. These are dominated by visions of optimization of urban processes, resources and infrastructures geared towards making cities more efficient, planned, managed and, thereby, sustainable (Gabrys 2014). This process includes the stereotypical examples of reducing energy use (Erickson et al. 2013; Clear et al. 2013) and emissions (Karakasa et al. 2007), management of waste (Mullins 2017) and increasing efficiency of existing food supply chains (Gandino et al. 2009). The earlier examples primarily focus on sensing and tracking technologies run on mobile and cloud computing systems (Khan et al. 2013). Such top-down, technological solution-led services and outcomes are increasingly critiqued for their approach to urban sustainability (Foth et al. 2015; Heitlinger et al. 2018) as they misrepresent and disempower citizens by taking away agency and political will to act (Gabrys 2014). Also, they disregard the natural, messy complexities of cities (Mullins 2017) where on-ground realities can lead to breakdowns in the technology-dominant visions (Hollands 2015; Mullins 2017) they started with. These criticisms create a recent growing field of interest in design and HCI to rethink technological advancement through citizen involvement and dialogues (DiSalvo and Jenkins 2017; Antoniadis et al. 2015; Balestrini et al. 2017; Foth et al. 2015; Thomas et al. 2016). These approaches will position urban communities in the centre of such conversations through citizen participation and established sustainable practices.

Furthermore, food growing is an anticipatory practice carried out by communities in response to environmental and social concerns. Urban communities cultivate spaces for equity and build community movement (Gui and Nardi 2015; Lampinen et al. 2019). However, they also face issues related to availability of land, resources, government policies and internal politics (Biørn-Hansen and Håkansson 2018). Additionally, urban communities offer significant insights into everyday sustainable practices such as food growing (Lyle et al. 2015, 2014). Communities involved in sustainable food growing create resilient local food systems and reclaim the right to the city (Purcell and Tyman 2015; Heitlinger et al. 2019) through their practices. Recent interest in this area, within the design and HCI communities, highlights the importance of understanding collective grassroots action and systemic change in response to unsustainable commercially intensive food systems (Raturi et al. 2017; Norton et al. 2017; Chopra 2019).

Our work engages urban food-growing communities in thinking expansively about the future of food growing to incorporate grassroots voices and build understandings of sustainable cities beyond the values of efficiency and neo-liberal agendas. Through speculative and participatory ways of designing

visions for future food growing, we examine the complexities of urban spaces, contributing to reimagining socially just practices to design social and technical systems. In turn, we aim to highlight alternate visions embedding ecological and social sustainability values to gain sovereignty and control over urban landscapes of future food growing imagination.

## **METHODOLOGY**

This research is grounded in the practice-led approach of research through design (RtD) (Durrant et al. 2017; Frayling 1994) for its value in driving interdisciplinary inquiries (Zimmerman and Forlizzi 2014). The practice-based design research that generates knowledge is part of the recent practice turn in HCI (Kuutti and Bannon 2014) that brings material practices to the fore, emphasizing a shift to pluralistic knowledge generation carried out in everyday practices 'in the wild' (Chamberlain et al. 2012; Rogers et al. 2013). In this work we use design workshops using speculative and participatory approaches to engage a practice-based community to meaningfully and collectively think about sustainable futures for urban food growing and explore barriers and opportunities for future socio-technological systems.

### ***Food-growing community and participants***

We are working with a neighbourhood located in the north-east of England, which has seen significant funding cuts by the council over the past decade. Community funding and infrastructure like the local allotment site have been taken away in the neighbourhood due to recent austerity measures. The residents of this economically deprived neighbourhood are multi-ethnic, with many originating from South Asia, the Middle East, Africa and Eastern Europe. This diversity is reflected in local food shops adjacent to residential houses, where the residents primarily buy their food. The neighbourhood already has several active citizen initiatives, including maintaining the public park, litter picking, rewilding, time exchange, fundraising and local food-growing schemes. Food-growing practices in the neighbourhood are multifaceted and involve many initiatives, including local micro-businesses, community events, knowledge exchange, etc.

The neighbourhood is located alongside a large public park with a community orchard and a fenced garden used for communal food growing next to public allotments. Most of the residents live in small, terraced houses with little or no space for food growing, leaving them to grow food in small concrete spaces using containers.

Communication across the group happens in many ways, including social media, e-mails, word of mouth, and flyers to inform people about the events and stay connected, share queries and videos.

People within the larger neighbourhood attend the free public events organized by the food-growing community. They are invited to plant seeds, exchange excess plants and learn about local food growing. Many members at times have highlighted ongoing challenges of access to infrastructure, limited financial resources, council support, growing space, uncertainty about growing food, wider engagement in the area and time constraints as critical challenges in their endeavours. We chose this research site to reflect on bottom-up perspectives about the future of food growing in urban landscapes, gathering from the margins the views for future citizen-centric cities to provide a different bottom-up perspective.

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### ***Workshop process, data collection and analysis***

The workshops were aimed to engage the food-growing community in co-imagining the future of food growing in their neighbourhood through creative exploration and experimentation. The workshops focused on exploring values, aspirations and challenges within the community and their effect on the futures participants developed together.

The workshop series attracted twelve community members and each workshop had four to eight residents, which saw an overlap of attendees as many participants returned to the following workshops. They self-identified as English, Polish, Swedish or Mexican and were interested in or were already growing food. They were recruited through word of mouth, directly approaching individuals and through posters in the community garden. The workshops were designed as three–four hour sessions with a drop-in format, offering a free lunch, a skill-sharing session and free seed bags to attract the residents in the neighbourhood.

After collecting informed consent from the participants, workshops were audio and video recorded and we captured photographs to document the made and drawn items. Field notes were also made to document participants' reactions and embodied interactions in space. Audio data was transcribed and anonymized, while the video data was annotated. After each workshop, two researchers coded the data through thematic analysis (Braun and Clarke 2013). The initial findings pointed to the community's values, needs and problems. The research team used these to develop insights for designing the activities for the subsequent workshops, detailed in the next section. The collected data was later segregated to focus on accounts, where participants describe the futures. These accounts were coded through thematic analysis (Braun and Clarke 2013) to identify patterns and themes in the data. The codes were reworked and iterated over time by different research group members to create consistency and agreement when grouping the codes into themes. These were to inform on futures for urban food growing, barriers and opportunities affecting these futures and socio-technological systems linked to food growing in future cities.

### ***Reflective iterative process of developing the workshop series***

The project started with the intent to creatively explore possible speculative approaches to facilitate the co-creation of bottom-up community-led visions of food growing. To allow speculative activities to be fruitful, the researchers had to build trust and a working partnership with the participants while focusing on strengthening bonds within the community and being sensitive to conflicts arising from collaborative work.

The exploratory study was created to be a series of workshops where insights and reflections from each workshop informed the design of the next workshop. The research team iteratively analysed the data and made decisions collectively informing the design of each workshop. After we conducted a workshop, the recordings were transcribed, video data annotated and later coded by two researchers to develop initial findings from each workshop carefully. These were values, needs and problems faced by the community, which were used to design activities and scenarios in the subsequent workshops. The detailed process that we followed to design each of the workshops and its methodological implications are discussed in detail in an earlier article (Chopra et. al 2022).

The series of workshops also invited participants to imagine food growing futures in different time and geographical scales. This had implications for the envisioning process, introducing social, material, political and economic dimensions. We wanted to introduce these speculative shifts to create possibilities of re-imagining systemic change in the mainstream food systems which run parallel to the participants' food-growing practices. The documentation of the design process through notes and observations included these shifts, the subsequent reactions of the community members to the speculative tropes and their response to them.

The design process of the workshops usually reflects the power held by the designer and the design researcher. However, the embedded reflexivity in our process balances the researcher's power by critically, carefully and thoroughly integrating the learnings on the field and participants' perspectives within the design of the series. Throughout the iterative development of the workshops in the series, the researchers engaged in a deeply reflexive process which considered the evolving positionality of the researcher, unfolding the research 'in the wild' (Chamberlain et al. 2012; Rogers et al. 2013) and 'staying with the trouble' (Haraway 2016). This reflexivity helped in the iterative design and curation of safe spaces to voice concerns, build equity in participation and manage the impoverished thinking linked to dystopian futures, fear and anxieties.

### ***Individual workshops***

This section describes each workshop and its activities to understand better its process and the data collected. Please see the related publication for more details on each workshop design (Chopra et al. 2022).

#### *Workshop 1: Mapping the neighbourhood*

In the first workshop, we aimed at building trust as well as an understanding of the community and its practices. We designed the workshop as an invitation to open up conversations between the researchers and the participants about the neighbourhood, food growing and sharing. The participants were asked to map the neighbourhood (see Figure 1) their houses, the growing areas and the potential growing areas for the future on a hand-drawn map. The participants were given prompt cards to fill in (see Figure 2) their current gardens, future gardens and food interactions, like sharing and giving within the community. The participants mapped places, foods they grew, neighbours they have and talked about foods they would like to grow and how these would fit within their imagined personal gardens. The activity was focused on the present realities, mapping the human scale of everyday practice within personal interpretation and aspirations, reflecting on activities the residents would like to carry out in the neighbourhood.

*Table 1: Workshop series and activities.*

<b>Workshop 1</b>	<b>Workshop 2</b>	<b>Workshop 3</b>	<b>Workshop 4</b>
Mapping the Neighbourhood	Walking the Neighbourhood	Playing a Future Lands Game	Making a New World

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Figure 1: The participants populate the cardboard map with prompt cards.

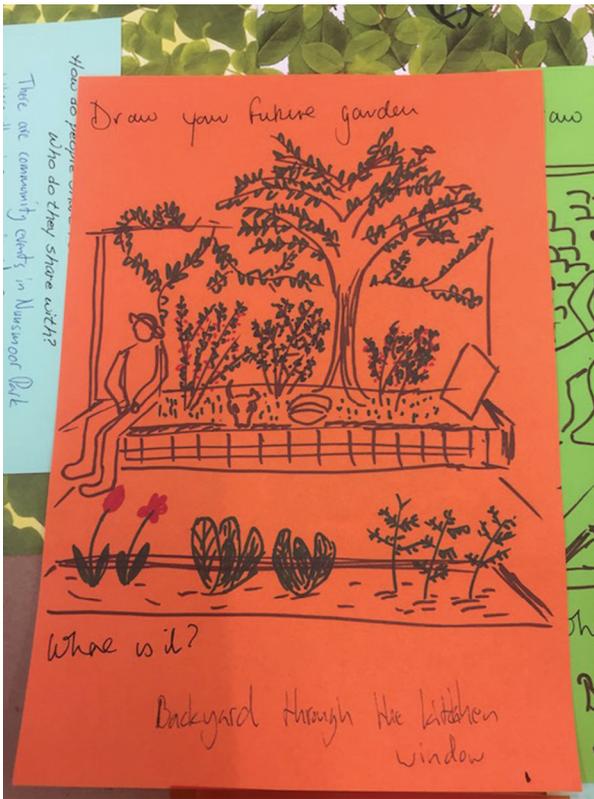


Figure 2: Prompt card drawn by a participant depicting his future garden.

### *Workshop 2: Walking the neighbourhood*

In the second workshop, we walked the neighbourhood as seen in Figures 3 and 4, with the participants, visiting locations discussed during the last workshop. The aim was to ask the participants to re-imagine the present through the fictional scenarios we provided at specific places where we stopped on the walk, for example, the contested back lanes. The fictional scenarios, both positive and negative, were developed through a desk survey of recent news articles, successful neighbourhood projects and topics. These scenarios were based on other successful community projects in the UK and we wanted to use them as material to inspire co-imagination. An example scenario reads, 'imagine if the neighbourhood won an award from *Grow Your Own* magazine for best innovative "green" food growing community? How do you think this could be achieved?'. All scenarios were mapped to specific locations in the neighbourhood based on discussions in Workshop 1. The participants discussed the scenarios, how they could achieve them and how these would impact the food growing and sharing in the neighbourhood. Thereby they exposed problems, conflicts and limitations faced by the community when growing food in the neighbourhood.



*Figure 3: Participants on the walk, pointing at edible plants growing in the urban environment.*



Figure 4: Participants during the walk.

### Workshop 3: Playing a future lands game

Building on the previous workshop, we wanted the third workshop to introduce the elements of temporality and scale. To shift focus from the neighbourhood and look at value systems, fears and problems faced by the community, we followed a macro-perspective. This way we broke away from immediate routines and the physical world of people's everyday lives, as done within the last two workshops. We developed a turn-based board game, which can be seen in Figure 5, played with a dice, which consisted of different future worlds that participants had to cross while playing. The worlds in the game were based on outlines of future concerns discussed in the previous workshops. We populated the game with fictional worlds based on popular media and discussions from previous workshops. For example, Brexit was discussed as a concern for food-growing policies in both Workshops 1 and 2 by the participants, so, we developed the Land of Brexit in the game to delve deeper within these concerns. Similarly, Land of robotic farmers was created to explore further the discussions around consumer future technologies for food growing discussed in the previous workshops. Similar was the case for other lands in the game, such as Land of Climate Change, Land of Biodiversity, etc.

The participants were asked to roll the dice and move on the board to discuss the impact of food growing in the specific world they landed on. To further support discussions, we created a deck of cards, some samples of which are seen in Figure 6. We designed the cards as beasts of opportunities and beasts of concerns that would affect food growing. These were based on ideas, values and fears of the participants related to food growing discussed in



Figure 5: The future lands board game.



Figure 6: Beast of opportunity and beast of concern cards to accompany the game.

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the previous two workshops. For further details please see our related paper (Chopra et. al 2022). Example of the cards are as follows:

- Beast of concern: the aphid of competition, magpie of community
- Beast of opportunity: hare of intergenerational exchange, owl of knowledge.

#### *Workshop 4: Making a new world*

Our reflection and data from the previous workshop showed a lack of agency and control experienced by the participants that limited their expansive thinking. In the final workshop, we decided to develop a fictional scenario for a world-building task where the participants had to build a world in 3D using scrap material provided to them. The scenario was designed as an invitation letter, building on the positive experiences and skills of the community as experts in food growing. The letter was addressed to the community members from the British Interplanetary Society, intending to visit and build infrastructures conducive for growing in the new-found planet, Earth X. This gave the participants agency and material to build a new world from scratch, building their individual worlds while taking inspiration from one another see the worlds built by participants in Figures 7 and 8. The participants later described their idealized visions of the new world where most of them used technology. These ideal worlds were less ridden with trouble and conflict and were places for desires and wonders.



*Figure 7: The land of wisdom and reuse built by Rose, a participant.*



*Figure 8: The land of festivities and biodiversity built by a researcher with the participants during the workshop.*

## **RE-IMAGINING A DEPRIVED NEIGHBOURHOOD THROUGH FOOD GROWING**

In this section, we detail how the existing community structures, activities and concerns frame the future of food growing through the perspective of this community. We create descriptive accounts of our inquiry through themes, followed by interpretations and reflective takeaways.

### ***Limitations of present resources and infrastructure affect futures***

In our work, futures were closely related to reality and everyday life, even if we wanted them to be disconnected, thereby creating the possibility of a temporal shift. They were still embedded and formed through participants' experiences and world views. During the workshop series, the participants co-created futures relative to their present situation and everyday life. These futures were closely based on their experiences and understandings, and the future description focused on how current reality might shape the future or be changed by it. For example, when participants were asked to consider a scenario where they had achieved 25 per cent self-sufficiency of plant-based food, they discussed the practicalities of this in terms of lack of resources. These conversations reflected the current lived reality of the neighbourhood affected by council cuts and austerity measures, which created a lack of resources, such as communal meeting spaces, inaccessibility of land to grow food and money. The fictional scenario did help in re-imagining the neighbourhood through the reuse of existing areas and buildings to grow:

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I just don't think you could [...] do 25 per cent in the space the terraced houses have got. I just think it would be too far a step. You're going to have to use everything. You would need some space, the community would need specified allotments or specified green space.

(Bernard)

You could farm the parks and churchyards [...].

(Martin)

Actually I can think of a great green space that nobody's ever been near on the [road name] for years [...].

(Bernard)

We also found that participants' perspectives about the future were influenced and expressed through values, assumptions and biases, generally expressed implicitly. These biases and assumptions were based on participants' present lives and experiences, particularly when futures were closely linked to the reality of the neighbourhood. In the following excerpt, participants describe their concerns around vandalism and theft in the neighbourhood that would affect their ability to grow food in front yards and gardens in the future.

[...] growing outside your house here every passer-by could help themselves if they so choose. If there was a lack of food then it would be very difficult to secure anything anybody grew at the front of their homes.

(Lola)

So there needs to be an understanding that food that is grown close to the house primarily belongs to the person living there and growing the food. That needs to be established well within the community that everybody doesn't help each other.

(Betty)

It's enforcement.

(Bernard)

The described futures were also based on an existing political, social context and beliefs of the participants, thus, expressing ideological ethics and values. For instance, while playing the game in Workshop 3, participants were concerned about the effects and changes on the food-growing policies within the context of the Land of Brexit.

[...] I mean it's fair enough if you're importing lots of food from other places, but I mean if you've got a British farmland that is just growing one crop, I mean ... Monoculture. That's what I'm thinking of. That's the dangers of it, isn't it?

(Lola)

While assumptions, beliefs and values are implicit, personal memories or knowledge of other existing cultures or places are drawn on more explicitly as inspirations or influences to provide a rational grounding for the imagined

futures. For instance, a participant in Workshop 4 imagined the use of plastic as a material currency, in the new food growing planet.

The plastic stuff on here is not from this world. It's come from the old world because we've got enough plastic, we don't need to make any more. So we never run out, we just keep reusing it [...]. Their own bank of plastic. They can share it with people who haven't got enough. [...] No longer a throw-away society [...]. Well, I suppose it's [plastic] seen as something to be treasured and it's precious.

(Rose)

Such influences, positioned in a post-earth scenario, throw light on new ways of examining and re-imagining the world, still within the confines of what we perceive as real and connected to the reality we live in today. These are entwined with values, biases, memories and experiences framed through daily practices of everyday life. Therefore, we suggest that futures are not enacted in isolation; they are interconnected to various social and material aspects (Halewood 2017) which are embedded in practice. These practices are formed over a period of time through the influence of society, politics and economy; and futures are imagined through this sociopolitical-economic frame (Tran O'Leary et al. 2019; Baumann et al. 2016; Heitlinger et al. 2019). This research presents the potential for examining futures which are closely related to material and social reality of communities for creating on ground change.

Therefore, contestations between the present and futures should be considered as bi-focal connections rather than one leading to an outcome. These connections can be created by interlinking the future activities to the current practices or embedding present-day progressive values to create positive outcomes through the integration of communities in discussions about futures (DiSalvo and Jenkins 2017; Baumann et al. 2016; Wakkary et al. 2013; Lyckvi et al. 2018).

We also suggest the creation and use of a combination of approaches; for example, designers and technologists need to integrate better on-the-ground actions and values of present sustainability communities into the design of or visions for future technologies and systems for cities. These communities, through their longitudinal, everyday slow actions, ideologies and shared value system (Norton et al. 2019; Heitlinger et al. 2019), challenge mainstream political ideologies and social context. Therefore, integration of these ideologies and values into research can help researchers and designers to imagine alternatives and deeply look at their contestations. That can further help designers operationalize design to create safe spaces for exploring alternate subaltern (Spivak 2012) narratives for bottom-up sustainability.

### ***Inability to work at scale due to lack of buy-in of stakeholders***

The futures are enabled and enacted through interrelated systems and stakeholders. While assumptions, biases and values implicitly shape the futures, these are also closely related to the stakeholders with whom these futures can be acted on. Futures can be hard to imagine if the community is not able to think of stakeholders who can put these futures in action, as highlighted in a quote from Betty:

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Isn't the question as much as where, who? [...] I'm just wondering about the people who are going to want to spend time and effort maintaining, for example, a vegetable garden for other people's benefit. Or perhaps I've got a very twisted view of humanity.

(Betty)

This sheds light on systems and stakeholders' interconnectedness, which influences food growing in the neighbourhood. The neighbourhood's immediate problems (such as fly-tipping, theft and security) come from a lack of mutual trust and sense of community within the residents. Moreover, our findings indicate that futures are enabled through the addition of like-minded stakeholders, with similar value systems or practices, to create a positive change. For example, the participants express the need for extending the community by involving schools and taking advice from professional urban growers to be able to grow 25 per cent of their food requirement in the neighbourhood, in response to the fictional scenario. However, inclusion of stakeholders beyond the purview of the community like the corporations and councils was seen to be a top-down policy negotiation. For example, Bernard talks about the possibility of a green rebate by corporations in lieu of green work done by the community members towards society.

[...] I honestly think that some sort of environmental rebate, you know, on whether it's your [water] rates or whatever. And that could be linked to the amount of things you recycle, the amount of things that you grow, composting and things like that. Or would probably class it as a green rebate or rebate on your [water] rates.

(Bernard)

Moreover, the participants also felt a loss of agency and power within these scenarios as these were co-dependent on hegemonic systems beyond the influence or control of the community. This loss of autonomy led to the suggestions of self-sufficient futures, like the development of community enterprises of communal composting and garden centre. Therefore, the role and impact of stakeholders can enable or disable futures as seen with examples involving other local residents, local councils, corporations and the government. Therefore, for radical re-imagining of existing systems, acceptance and inclusion of different stakeholders is required.

When thinking about grand future visions for cities, the stakeholders become numerous and the existing top-down, hegemonic narratives do not embrace this complexity which is both social and political (Hollands 2015; Mullins 2017). Therefore, we suggest a move away from the neo-liberal notion of the individual as the vehicle of change (Dourish 2010), and incorporate discussions around who enacts and enables these futures within community settings. These new stakeholders, like the addition of children and schools, will create the possibilities of intergenerational exchange through the creation of interconnected systems which can uphold the on-the-ground development of new alternate futures.

Therefore, we believe thinking of futures in terms of interconnected web of practices and stakeholders would be fruitful to create future systems. At present, when looking at futures, we do not take into consideration the future stakeholders or the scale at which these futures would be in effect. Therefore,

technologists and designers need to consider these within conversations that concern corporations and policy-makers to help enable community futures.

### ***Erroneous promises of future technologies***

We now look at the interconnections of social systems with current and future technologies. The design of the workshops was technology agnostic; however, they did spark lively discussions about the constraints of technology and the use of low-tech everyday devices, possibilities of future technologies, and the technologies for the future. For instance, in the case of Land of robotic farmers in Workshop 3, the participants expressed their concerns with current offerings of technology and the popular imagined technological futures in the game. Their discontent is linked to the inability of the present or near-future technologies to offer any support to their food-growing practices, or not fulfilling the promise offered.

[...] Is technology going to be the answer to it? I mean I can remember back in the days when I was young and technology was just really starting to come up, you know, and there was oh one day robots will be doing everything and you'll have all of this leisure time to yourselves [...] I'm still waiting? I'm 60 [...]. Is it just pipe dreams?

(Lola)

Lola's expression of pipe dreams explains the media-led technological visions sold by neo-liberal corporations. Such instances make the participants inclined towards low-tech practices that they are accustomed to, have agency over, are low cost and serve their purpose. Within this, we see polytunnels, vertical food growing, hydroponics or solar-powered lights.

We also found participants approached thinking about technology for future food growing in different ways. The most common is the problem-solution framing, where futures are considered to be responses or solutions to perceived problems or challenges in the present. For example:

I would like is, a device which [...] would measure the nutrient content of my soil [...] because it's really impossible to tell with containers what needs adding [...]. I don't know whether it will ever be possible, but you know that you put like a pH meter in the soil and it does all the pHs. [...] I'd like something put in the soil that told me what the NPK was. [...] particularly like before planting a new crop [...] because you don't want to keep adding something if it's already there.

(Martin)

In this example, the participant considers a problem that they have already experienced, knowing whether the nutrient content of their soil is appropriate for their crop, and incrementally speculates about the functionality of a future device that would address it. In the instances where participants thought about the future in more open-ended, exploratory ways, they built narratives, such as 'community growing'. For example, Martin mentioned enabling community growing on a new planet by sharing seeds and tools, and using an interplanetary internet that also works as a teleportation device.

Thus, thinking about technological futures can be punctuated with differences in perspectives and opinions, leading to disagreements. While these result from people's experiences or prejudices, they are also a result of conflict

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of values regarding the technologies. For example, the fictional scenario of ubiquitous and cheaply available robotic technology for farmers in the context of small-scale food growing is linked to fears of job loss, deskilling people and the loss of tacit knowledge over time. However, when looked through the lens of the community values, such as intergenerational exchange, the robot as a consumer or supporting device was seen positively.

One of the things maybe with robotic farming is if you're on it at the same time you're passing on intergenerational skills maybe that has got to be only a certain maximum amount of robotic farming and so much manual purely, so the skills aren't lost. So let's say you're allowed to do a maximum of 75 per cent on your land, robotic farming, but the last 25 per cent must be manual to preserve the skill, if that makes sense.

(Bernard)

This incident brings out the vibrant side of growing food and the value participants hold in the practice's performance for enjoyment, self-sufficiency and resilience. These interpretations of technological futures or future technologies presented in this article invite us to a re-interpretation of community technologies for food growing. In this work we presented perspectives of futures where technology is embedded in the daily practices of communities and closely related to place.

We envision these as low-tech futures, where everyday use of technology that the participants are accustomed to using, gives them agency and control. This goes beyond the definition of technology as it has been shared and understood within the context of large corporations. Within the context of this work, we suggest re-imagining existing technologies with participants within the context of their values and everyday practices. Moreover, participants within the workshops embraced technology as a way to apply tacit and implicit knowledge through practices and the use of tools in their everyday life.

We want to introduce to this the concept of creating 'assemblages of high- and low-tech futures', which can create the possibility of integrating incremental change (Halewood 2017; Marres 2015) within the integration and creation of larger socio-technical systems. Such integration would allow designers and researcher to create ways for DIY-technological assemblies for the communities to integrate into larger socio-technical systems, emphasizing the bottom-up approach, through autonomy and sovereignty.

## CONCLUSION

Earlier in the article, we argued how this work embodies the values, beliefs and tactics of a grassroots bottom-up action. We present this work as transient and fragmented images of sustainable urban food growing futures where these could be more commonplace or operating at a greater scale. From our work based in a deprived neighbourhood in the north-east of England, we introduce glimpses of bottom-up actionable futures from the perspective and scale of a grassroots neighbourhood community. Moreover, we show how the limitations of present resources and infrastructure, the inability to work at scale due to lack of buy-in from stakeholders and the erroneous promises of future technologies contribute to the conceptualization of food growing futures. This answers our question around the collective conceptualization of community-led food growing futures. We later discuss reflections, futures as an assemblage of socio-material realities and visions of high- and low-tech futures to

create possible future work and conversations through criticality and curiosity. We look at how we as designers and researchers engage with building future technologies for cities, thereby reducing the technological enthusiasm and solutionism (Lindtner et al. 2016) linked to systemic and scalar issues of hegemonic food systems and cities. Furthermore, we propose the potential for bottom-up urban food systems through participatory ‘worlding’ (Haraway 2016) to create better actionable futures.

We see the area of food design delving deeper into the aspects of growing food for addressing sustainability at scale. Moreover, this work is a collection of considerations for researchers and designers for developing socio-technological systems linked to food growing in future cities. Therefore, when considering futures, we suggest framing them close to reality as part of the situated everyday activities for the citizens. Also, within the engagement, we suggest emphasizing the importance of agency given to citizens to enact on ground change. This work provides a new approach to looking at the design of future technologies for cities and addressing systemic issues of hegemonic food systems through bottom-up actionable futures. We further want to provoke researchers and practitioners to look at these future possibilities envisioned by the participants as a web of practices and stakeholders, and explore their interconnectedness in different settings and contexts. Our view is that futures are not enacted alone as they are entrenched in social, political and economic systems. Lastly, we would want practitioners and researcher to look at the development of socio-technical futures through the assemblages of low- and high-tech futures, exploring the possibilities of alternative food-growing systems within a community-driven approach.

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