

# Circular Food Systems: A blueprint for regenerative innovations in a regional UK context

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## Introduction

The global food system is under pressure to supply affordable, nutritious and appetising products. To maximise production and affordability, the food system has become extractive, linear and excessively reliant on imports and long supply chains (D'Odorico et al. 2018; Rockström et al., 2020). Some island communities in the Caribbean, for example, rely on more than 80% on imports to feed themselves (Thomas, Moore & Edwards, 2018). Even a big, rich and fertile country, such as the United Kingdom, imports more than half of its food requirements (Lang, 2020). This has resulted in harmful environmental, human and economic health impacts (Godfray et al., 2010), including: increased greenhouse gas emissions; biodiversity loss; high levels of food waste; poor diets; preventable diseases; poorly paid jobs; low productivity; reduced opportunities for SMEs; etc. The average UK diet, for example, does not meet nutritional recommendations and has a higher carbon footprint than many high-income countries (Stenson & Buttriss, 2021). The UK imports increasing and unsustainable amounts of foods from climate vulnerable countries, threatening future food security.

The most promising solutions to these challenges will emerge from a shift to more diverse, regional food systems that adopt low-carbon and regenerative agriculture principles, engaging consumers to increasingly consume local, sustainable produce. Based on the principles of closing loops, designing effective and resilient food systems, diversity, multi-stakeholder cooperation, place-based food culture, participation and empowerment, as well as value retention and enhancement, we contend that regional circular food systems can create multiple, interconnected health benefits.

This chapter will introduce the blueprint of a regional circular food system from a UK perspective, which we believe is best achieved through a dynamic process of cooperation amongst multiple stakeholders (policymakers, businesses, citizens, NGOs) at the regional level, addressing multiple environmental, social and economic challenges in a specific geography. We define circularity as the practice of identifying and optimising feedback processes within systems to enable them to regenerate; reduce their dependency on external inputs; and maximise the optimisation-value to system actors and to the system as a whole (Fassio & Tecco, 2019; Alhawari et al., 2021; Sreeharsha & Mohan, 2021; Kowalski & Makara, 2021). Circular Economy principles and practices are extended here to take an integrated approach to addressing human, environmental and economic health via food systems transformation.

To instigate transformational change, we will outline three institutional innovations that are of relevance in the UK context, namely community-supported agriculture schemes, food hubs and public food procurement partnerships. Discussing existing cases of these institutional innovations, we will show how we can move beyond feted 'field-to-fork' approaches, providing a more integrated approach that aims to transform regional food systems. A word of caution. Our emphasis on 'regional' does not imply a protectionist or isolationist agenda that dovetails with the UK's recent exit from the European Union. On the contrary, a predominantly regional focus of food system intervention does not preclude global

cooperation and sharing between regions for mutual co-benefit and global human, environmental and economic health gain (Sibbing, Candel & Termeer, 2021).

Indeed, our circular approach to food systems closely aligns with a number of Sustainable Development Goals (SDGs) and other governmental and inter-governmental policy agendas. Most notably, regional circular food systems would help to radically reduce greenhouse gas emissions, helping the world tackle global climate change (Goodman, DuPuis & Goodman, 2012). It would also address other environmental challenges, such as biodiversity loss, soil health and water quality and security (Rockström et al., 2020; Schreefel et al., 2020). Our approach aims to improve food security by providing better access to safe, sustainable and nutritious food, particularly for the most vulnerable members of society, while reducing childhood and adult obesity and other diet-related health conditions. It also aims to radically improve the economic health amongst small-scale food producers and workers, which are amongst the lowest paid in many economies (Böhm, Spierenburg & Lang, 2020).

Currently, many local initiatives exist to address the problems of the food system. Yet, they largely operate individually, with little opportunity for coordination between them. What is needed is to link and coordinate local food initiatives to promote a “politics of possibility” and “new economic imaginary” within networks of place-based action for food systems change across regions. An integrated regional circular food system enables creative, locally embedded movements to become exemplars of new economic activity that brings to the fore human and environmental health.

## The current food system: extractive and linear

The evidence on the impacts of conventional and linearly designed food systems point to the need to re-think the design of food provisioning processes, considering simultaneously human, environmental and economic aspects (Moreau et al., 2017). Linearly-designed food systems have provided unprecedented agricultural productivity growth, advanced an abundance of technologies and infrastructure dedicated to food production and distribution, and in so doing, generated wealth and generous returns on investments for several food system actors (Pascucci, 2020). However, despite its promise, this approach to food provisioning, from production to market and distribution mechanisms, seems to be unable to feed the world (FAO et al. 2015), ensuring environmental and social benefits for all. Linear food provisioning approaches are characterised by economy-driven factors, often organized in large-scale and highly industrialized processes defined by centralization, dependence on external inputs (e.g. fossil fuel), high competition, domination of nature, specialization, and exploitation (Pascucci and Duncan, 2017; Rockström et al., 2017).

All these factors have contributed to the emergence of highly extractive food provisioning systems, with a growing evidence indicating their lack of resilience and sustainability. Today agricultural expansion is the leading driver of deforestation. Between the period of 2000 and 2010 localised subsistence agriculture accounted for 33% of deforestation and large-scale commercial agriculture accounted for 40% of tropical deforestation and land conversion accounts directly for the loss of 420 million hectares of forest since 1990 (FAO and UNEP, 2020). Additionally, agriculture directly contributes up to 8.5% of global greenhouse gas emissions with an additional 14.5% of greenhouse gas emissions derived from land use change (IPCC,2019).

This indicates the emergence of diffused food provisioning systems that are highly extractive, creating specific pressures on finite resources such as water, soil and biodiversity. These pressures are systemic and affect food systems at different scales and levels, creating a protracted socio-ecological crisis. This is in turn inherently linked to the linear and extractive design model of conventional food provisioning systems, employed from production to distribution and consumption. The problem for us lies in the way the food provisioning systems have been designed. These provisioning systems are typically organised in value chains in which resources are taken, used and disposed of. In such linearly designed system, natural resources are extracted, made into products (food, feed or fibre), commodified, consumed, and then disposed of, generating waste, detrimental emissions, and pollution. This wasteful, exploitative and resource-use intensive approach is often creating short-term economic benefits at the costs of

deterioration of human and environmental health, for instance in terms of environmental degradation, food epidemics, and direct contribution to climate change.

The UK is a case in point, which has for perhaps longer than other highly developed countries suffered from a linear and extractive food system, resulting in high rates of dependency on food imports. For example, for fresh fruit and vegetable supplies, the UK imports 84% and 47.3% respectively (Food Foundation, 2020). In consequence, multiple harmful human, environmental and economic health impacts and risks are rising in the shape of, for example, obesity (28% of all people in England - Health Survey for England), poor diets (only 26% of UK adults adhere to the 5-a-day guidance of fruit and vegetables intake), chronic non-communicable diseases; increasing microbial and pest resistance (due to overuse of antibiotics and other artificial inputs in intensive agricultural systems). Environmental impacts include excessive greenhouse gas emissions, biodiversity loss (e.g. breeding birds on farmland have declined by 45% from 1970 to 2018), waste pollution, and degradation of soils, freshwater and other ecosystems. The economic costs of these impacts are immense (e.g. UK soil degradation was calculated in 2010 to cost £1.2 billion a year). Meanwhile, those employed in the food system often experience poor working conditions, with jobs tending to be low-paid and precarious.

In the last few decades, there have been attempts to tackle these issues by stimulating incremental changes towards more sustainable practices, in all dimensions of food provisioning, as well as increasing measuring and monitoring of the negative impacts of these activities, such as through life cycle assessment (LCA), carbon footprint, and other eco-efficiency approaches (Verfaillie & Bidwell, 2000; Braungart et al., 2007). These concepts are all, in one way or another, concerned with using less resources and producing less emissions, thus being more efficient and environmentally sustainable. Eco-efficiency approaches attempt to minimise the speed, toxicity and volume of material flows, but fail to challenge, let alone, reimagine the linear and extractive approach of food provisioning systems. From an economic point of view, eco-efficiency can result in a short-term cost reduction as a result of using fewer materials. However, in the long(er) term, eco-efficiency implies socio-economic growth at expense of the environment and human health. Thus, a key limitation of eco-efficient approaches to enhanced sustainability is that (harmful) waste and negative impacts on the environment and human health remain an outcome of the production process.

Moving away from this extractive and linear approach requires more than just adaptation and more likely a systemic approach, in which food provisioning is re-imagined and re-designed to celebrate regenerative and restorative processes. Business-as-usual is no longer an option (IAASTD, 2009). So where do we start? How do we design our way out of a system that has a destructive impact on human, social and environmental health and ecosystems? In an attempt to address the limitations of the linearly designed food systems, we draw inspiration from the concept of regenerative food provisioning systems.

## Designing regenerative, circular food systems: three principles

In regenerative food provisioning systems, the aim is to counter the “taken, used and disposed of” tradition of conventional food production and, instead, design approaches where natural resources can be used and safely returned back to ecosystems. More specifically, regenerative food provisioning systems are intentionally re-designed around a set of three key principles: (i) closing loops and designing for effective and resilient systems; (ii) celebrating diversity through sharing, participation and cooperation; and (iii) place-based value retention and creation. The premise of this approach is that localised food provisioning systems are best suited for aligning human, economic and environmental health outcomes. This is because closer proximity allows for designing circular and regenerative systems that take account of local topography and ecosystems, local cultures and infrastructures.

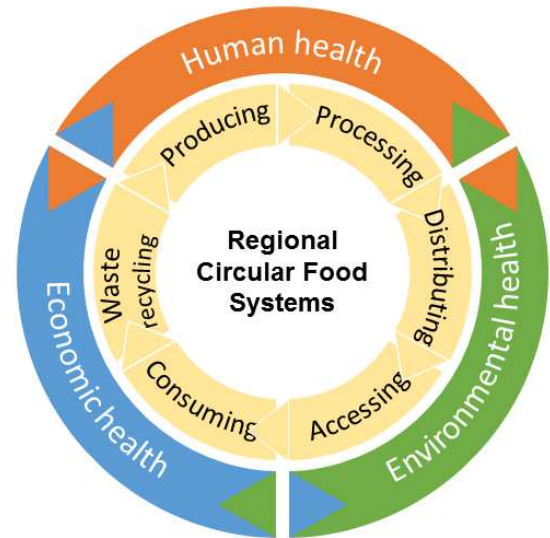


Figure 1: Regional Circular Food System Model

Figure 1 schematically depicts our regional circular food system approach where the inner circle symbolises the food chain (producing, processing, distributing, accessing, consuming and waste recycling), while the outer circle categorises the human, environmental and economic health dimensions of food systems.

The model depicts the design of a circular system that optimises the food chain not only for the economic benefit of food producers, distributors and consumers but also includes the human and environmental health dimensions as key parts. In short, it is not enough to produce food efficiently and at ever greater quantity so that consumers have an ever-wider choice, paying lower prices. This is linear thinking championed by an extractive regime. Instead, a whole systems approach needs to be taken, which functions according to the following three main principles:

### Closing loops and designing for effective and resilient systems

Following this principle, food production, distribution, and consumption processes should be designed around the use of renewable energy and materials, taking into account the properties of ecosystems. The aim is to design processes capable of returning biological nutrients safely back into natural cycles (D’Amato et al., 2019; Borrello et al., 2020). As such a truly regenerative food system is able to produce and distribute food avoiding the use of fossil fuels, and in general to use renewable energy and resources. Following this principle, food provisioning systems need to be designed eco-effectively; that is, in such a way that the use of hazardous and toxic materials is eliminated (Borrello et al., 2020). In this way, any food product would contribute to design metabolisms, promoting a positive synergistic relationship between ecological and social systems, economic growth and human health (Pascucci and Duncan, 2017). Closing loops and regenerating also means addressing the re-utilization of materials. Inspired by industrial ecology, in a regenerative economy, food products are designed to be used and consumed such that their biological and technical (non-biological) components (i.e. packaging) are not mixed (Borrello et al., 2020). Avoiding the mix of biological and technical materials means designing food products, and managing materials during the process, in ways that facilitate easy separation and re-use. Issues related to how residual outputs (i.e. packaging, or wastewater) will be used by another actor/participant in the cycle after usage/consumption are incorporated in the design of the product (Tukker, 2015; Borrello et al., 2020). In this way, within a circular food approach, it is not only products that are being designed, but also “streams” of nutrients. In practice, this means that the design of a food product will include the use of biodegradable or compostable packaging, or any packaging which can be upcycled as a technical nutrient in a given metabolism (e.g., paper, glass, plastics). Key to the design process is avoiding the use of materials that mix biological and non-biological nutrients. This results in a waste product that cannot easily be returned to the system, leading some to label such materials as “monstrous hybrids” (Braungart and McDonough, 2002). A typical example

of a monstrous hybrid would be packaging where cellulose and aluminium are mixed together in a way that they cannot be disassembled nor easily re-used (e.g. drinks cartons).

In linearly designed food provisioning systems, there is an inherent trade-off between resource efficiency and resilience (Borrello et al., 2020). While resilience calls for an interconnection and diversification of food systems, such that perturbations can be absorbed by and dealt with the different components (actors) of the system, efficiency is oriented to streamline production processes and celebrate standardization in isolation. Diversified systems prove to be more likely resilient and adaptive but are not always efficient in the short-run (Ulanowicz et al., 2009). Vice versa, highly specialized systems may gain efficiency in terms of resource use in the short-run, but because they rely on resource-intensive and standardized processes and they are so over-dependent on external inputs, they may lose the adaptability to changes, thus being highly inefficient in the long-run (Ulanowicz et al., 2009). A food provisioning system designed around sharing resources aims at reconciling efficiency and resilience through adaptive optimization processes. At farm level, optimizing stimulate the adoption of technology towards, for example, a more deliberate use of fertilizers and water (e.g. precision farming), to adopt a crop rotation, reduce the tillage (or eliminate it), and adopt permaculture and/or agro-ecological practices (Pascucci and Duncan, 2017). Optimizing along the supply chain also aims at prolonging the life-span of key materials, for example, re-using and up-cycling packaging (Borrello et al., 2020). At distribution level, it also deals with eliminating food waste, for example by improving the use of big data and IT-based platform to better organize operations and inventories in the retailing space (e.g. optimizing the storage capacities of retailers). At consumption level, reducing food waste entails engaging in changing food habits, fight obesity, starvation and the desertification of food landscapes.

### Celebrating diversity through sharing, participation and cooperation

The re-balancing of efficiency and resilience is also re-enforced by the principle of celebrating diversity. This is a wide system thinking approach inviting actors involved in the food provisioning system to think about local communities, justice and power unbalances, as well as collaboratively design rules and decision-making mechanisms to govern the food system. As food regime theorists have shown, the food system is highly concentrated today, dominated by a handful of global corporations (McMichael, 2009). This concentrated, even monopolized system is not very resilient, as it depends on just a few actors to function well. The call to celebrate diversity is to encourage people to think about how to foster collaborative interactions and democratize food systems, to make them more inclusive and hence resilient. This entails a decolonization process that allows local communities to take charge of their own food provisioning, in line with their local traditions and cultures, providing economic opportunities. A system designed for most people to shop in large supermarkets, which are owned by international shareholders in distant cities and countries, is not a diverse system that provides opportunities for the many. Instead, it encourages a culture of dependency on long supply chains, which, during crisis, are vulnerable. To overcome dependency, food systems need to be designed for sharing, participation and cooperation, giving voice and material stakes to local communities (Bharucha et al., 2020).

Circular food system initiatives are intrinsically collaborative (Pascucci, 2020). Often constituted as the outcome of a process of multi-stakeholder interactions, they rely on cooperation to survive and thrive. Community-supported agriculture schemes, for example, create stable networks of mutual support among citizens and with farmers (e.g. sharing skills, knowledge and resources). Food hubs allow food producers and consumers to come together and empower each other, generating new routes to market and improving local food accessibility. Public food procurement partnerships are grounded on the relationship between public authorities and local farmers, creating opportunities for deeper institutional change.

Not only these interactions and collaborations enable local-regional food production, distribution and trade, but they also create non-material goods (such as 'relational goods'), which are produced and consumed within the local community. The importance of relational goods for strengthening social capital and wellbeing is widely acknowledged by researchers and practitioners (Donati, 2019). Increasing social capital is essential for overcoming human and economic health crises, such as food related illnesses and economic exclusion and lack of opportunity.

The UK has a diverse food movement, comprised of a wealth of actors and organisations acting as advocates for food systems change in a range of ways, including by contributing to consultation processes such as recently informed the National Food Strategy, or the House of Lords Select Committee on Food, Poverty, Health and the Environment consultation on links between inequality, public health and food sustainability. The knowledge produced by civil society food organisations are informing current policy debates on food and sustainability, whilst also contributing to academic knowledge production. Academics have a long history of researching social movements but in recent years more participatory approaches are being deployed where academics research alongside partners in social movements, civil society organisations and informal community groups (Gillan & Pickerill 2012, Sandover 2020). This switch is important as there is greater awareness of the wealth of knowledge and evidence produced by civil society organisations and community groups.

Our approach set out here is informed by working alongside the UK food movement. By taking a collaborative, participatory approach with research partners, we have been able to gain knowledge on current debates and concerns relating to sustainability within the food system, whilst also sharing our expertise with our partners to drive change on the ground. This participatory approach enables knowledge production processes that support community empowerment through food practices. Examples include the recent Food for Change Programme that operated in Cornwall to support people back into employment, volunteering or training. Food for Change ran community-based food skills training via cooking and growing workshops, alongside one to one mentoring, to support participants who lacked food skills, experienced food insecurity, poor health and experienced loneliness. Similar programmes that empower communities through food are being supported by civil society food organisations across the UK (Blake, 2019).

### Place-based value retention and creation

Academics, entrepreneurs and policymakers often assume that larger scale equates with greater impact. In the management literature, scaling is usually referred to as 'scaling-up' and considered a synonym for organisational growth and success (Ruggiero, Martiskainen & Onkila, 2018; Macqueen et al, 2020). Business strategies are thus often dominated by the search for economies-of-scale and the desirability of organisational growth is rarely in question. The assumption that global is the optimal scale is also reflected in current international trade negotiations by the UK government, in which food and agricultural products feature prominently.

However, initiatives that embrace integrated, circular approaches to food systems (e.g. community-supported agriculture schemes, food hubs and public food procurement partnerships) challenge these assumptions. Largely operating at a local-regional level, whilst engaging in multinational cooperation and solidarity, these initiatives are connected by a web of complex relations and the willingness to address the global challenges that threaten our future. In the context of alternative food networks, the question of scale is a question of purpose. What is scaling for? Circular food systems require changing the goal: 'from endless growth to thriving in balance' (Raworth, 2017). Consequently, this requires changing the way scale and scaling are considered: a global scale is not necessarily optimal; nor is scaling up always a route to impact.

Research on diverse economies and alternative food networks shows that innovations scale through different routes including impacting policies (scaling-up); impacting culture (scaling-deep); and impacting greater numbers (scaling-out). Different scaling routes involve different strategies, such as advocacy and campaigning (scaling-up), replication and diffusion (scaling-out) and storytelling, transformative learning and community of practice (scaling-deep) (Moore, Riddell and Vocisano, 2015). Transforming food systems requires action at different levels, including at local and regional scales. This is where circular food initiatives are often situated and where they thrive. Operating at a local-regional scale means increasing the opportunities for different stakeholders to participate in the food system. In a virtuous circle, participation strengthens trust that, in turn, reinforces cooperation (Jarosz, 2000). Short supply chains enable the development of local food cultures, improving the sense of belonging and wellbeing; and food sovereignty

allows both producers and consumers to have more influence and control over food production, distribution and trade.

Whilst operating at a local-regional scale, circular food initiatives rely on each other to increase their impact (scaling-with). For example, they gather in local networks and constitute food hubs, support each other through creating solidarity economy districts and join international networks such as La Via Campesina. Building networks and partnerships is a vital strategy that allows diverse enterprises to retain economic, social and environmental value locally; and exercise their influence globally. Circular food systems is a term aligned with other descriptors used for local or place-based food systems, such as Local-Regional or City-Region Food Systems and Civic Food Networks (Renting et al., 2012). It denotes action towards addressing contemporary food issues including complex issues of power, social justice and community resilience, amongst others. A key focus is on local value retention and creation. While a system that is monopolised by a handful of powerful actors transfers value out of local places into the hands of distant executives and shareholders, a place-based approach secures local value retention and creation. A community-supported agricultural farm business, for example, supports local jobs, enhances local social capital and produces food within a local ecosystem environment. 'Value' should here not be seen as simply economic value, but as an integrated value system that aims to optimise human, environmental and economic health dimensions.

A place-based approach to envisioning and delivering a circular food system fits with wider food policy scholarship and the work of key civil society organisations, which contends that place-based food policies are effective in addressing complex food issues (Morgan & Sonnino, 2010, Sonnino et al., 2016, Moragues-Faus & Morgan, 2015). Place-based Food Initiatives are being deployed at a range of scales across the UK, from city level, borough to countywide projects, as exemplified by the networks convened by The Sustainable Food Places Network, Food Power Alliances and Feeding Britain projects. Place-based approaches take into account context-specific environments and can take a more integrated approach that works across policy sectors and silos. In the UK a plethora of Local Food Initiatives have arisen in response to England's food policy vacuum (although there is hope that this will change via the work of the National Food Strategy). The ongoing work of the Sustainable Food Places network, with its 57-strong, UK wide membership, undertaking place-based food policy and programme change, demonstrates the momentum of activity behind place-based approaches to food systems transformation.

## Institutional innovations for regional circular food systems

To transform regional food systems, new, innovative institutional models are required, which are able to synergise previously disparate activities. In the UK, for example, there have been many local, small-scale attempts to bring about positive change in the food system. The 'Making Local Food Work' campaign, for example, 'aimed to reconnect people and land through local food by increasing access to fresh, healthy, local food with clear, traceable origins' (Sustain, 2021). This resulted in many positive projects, such as the establishment of food hubs, food co-ops and buying groups, the mapping of local and regional food systems, and the improvement of hospital food (Hinrichs & Charles, 2012; Kirwan & Maye, 2013). These were meaningful projects that created change in local communities, helping to rebuild local food cultures and economies (Santo & Moragues-Faus, 2019). Yet, they rarely had supported by institutional actors, such as local authorities and other large so-called 'anchor organizations' (Mount, 2012). Change efforts were hence rarely sustained, keeping dominant food regime structures in place. The dominance by UK supermarkets is unbroken (Murray & Caraher, 2019), as supply chains are getting ever longer, and UK high-streets are ever more marked by a proliferation of fast food outlets, serving unhealthy food with low or no nutritional value (Hubbard, 2017). Meanwhile the human, environmental and economic health indicators associated with the UK food system are becoming worse, heightened by the COVID pandemic. Obesity rates, for examples, have increased exponentially over the past two years.

The UK government has tried to take action by bringing in a so-called 'sugar tax' in 2018, officially known as the Soft Drinks Industry Levy (HM Treasury, 2018). Focused on reducing consumption of sugary soft drinks, it has reportedly made a difference to sugar consumption, particularly by children; i.e. it is working (Jones, Wu & Buse (2021). Aware of the multiple factors involved in the UK food crisis, the government has also

commissioned Henry Dimbleby to write a National Food Strategy (2021), whose report was published in 2021. These are positive steps in the right direction. Yet, whatever has been done so far has not worked sufficiently to shift the UK food system towards a more sustainable future.

We suggest that new institutional approaches are needed to create sustained, transformative change in the UK food system. While large institutions, such as local authorities as well as central government, play an important role in driving change, it is important to not only think about change as a top-down movement. As our discussion of scale and place-based approaches indicated above, cooperation amongst small-scale actors can equally create sustained, transformative change that is able to create multiple value benefits local communities, ecosystems and economies. We will now outline three institutional innovations as examples of how such transformative change can practically look like within regional circular food systems.

### Public food procurement partnerships

In the UK the public sector spends about £2.4bn per year procuring food and catering services (DEFRA, 2014). Given the significant spending power and number of people these institutions feed, the purchasing decisions made by public sector procurers influences every aspect of the food system as well as a myriad of externalities, including the natural environment, human health, biodiversity, skills and training, the climate, economies of all scales, sense of identity and material extraction.

As the UK government's A Plan for Public Procurement (DEFRA, 2014) notes, effective public procurement can deliver a range of benefits including: supporting a thriving local economy; rewarding food producers for operating to high animal welfare standards; building training opportunities into contracts to ensure a well-skilled food and farming sector; tackling health issues by enabling people to eat well across the public sector; tackle food poverty, which has been raising exponentially during the COVID-19 pandemic; helping school children value their food by knowing where their food comes from, and how to cook healthy meals. By choosing to purchase food that is locally and sustainably produced as well as highly nutritious, the public sector is uniquely placed to drive transformational change that will put a sustainable environment, healthy people and healthy local economies at the heart of the UK food system.

Yet, in practice, the enormous potential for public sector procurement to drive change has barely been tapped. Instead, cost-reduction remains an overriding objective for purchasing managers (Marshall et al., 2020) due to the lack of compelling evidence to prove the value in procuring sustainable food as well as the lack of enablers to make that procurement possible and feasible (i.e., policy, technology, logistics and supply). Due to their significant spending power, large 'anchor' institutions (e.g. local authorities, schools, universities, hospitals, prisons, etc.) are ideally placed to transform the agri-food system by demanding higher standards of suppliers. The Preston model (Whyman, 2021) suggests that anchor organisations can produce positive knock-on effects beyond the immediate supplier-procurer relationship, positively influencing local and regional economies. Yet, across the UK, thousands of small, regional suppliers of nutritious, sustainably produced food find themselves excluded from procurement chains in favour of larger national or multinational operators (Stahlbrand, 2018). We view this disconnect as a profound market failure, because smaller-scale and regional suppliers have the potential to support public sector organisations in driving positive environmental, health and economic outcomes.

We contend that the food chain (see inner circle of Fig 1) can be made more resilient by linking public sector buyers with a network of producers, delivering multiple human, environmental and socio-economic health benefits (see outer circle of Fig 1). Our perspective is both informed and supported by non-academic partners with direct experience of the challenge of sustainable food procurement and its potential for transformative multiple health benefits. A recent report highlights that this regional approach 'does not have to be more expensive – and at the same time we can support local, seasonally produced food, which is often healthier for the consumer, has lower food miles, and chimes with the Government's own 'net zero' and future farming ambitions too' (House of Commons, 2021). This confirms that regional public procurement 'has the potential to produce major reductions in food carbon footprints' (Devon Climate Emergency Response Group, 2020). Giving local producers access to public sector procurement would create local jobs and increase economic resilience of rural communities. Those employed in the food



system often experience poor working conditions, with jobs tending to be low-paid and precarious (Lewis et al., 2015). Cutting out intermediaries and forging direct and equitable business relationships with major procurers would improve livelihoods for local producers.

### Food hubs

Food hubs, which aggregate food, typically from local and smaller producers, distributing it to a local customer base, have emerged in the UK as an innovative alternative to the current linear agri-food model dominated by large scale producers, processors, distributors and retailers. Frequently grounded on the principles of open innovation, food hubs are characterised by collaborative working and a focus on effectiveness-orientated agro-ecological principles (Psarikidou et al. 2019, Guzman & Reynolds 2019). Whilst food hubs aim towards localising the food economy by supporting local food distribution, they can have a variety of meanings within academic literature, community organisations and social enterprises. Guzman and Reynolds' (2019:4) report found that:

'In practice, we have found food hubs, both here and in the US, to be very varied in composition and purpose. Some are focused solely on building an alternative local and/or more sustainable food supply chain, while others also aim to deliver wider social, economic and environmental benefits.'

Place-based food organisations such as Food Exeter, Bristol Food network, Food Durham and others, see local food hubs as potentially fulfilling two roles: 1) a collaborative approach to creating new routes to market that enable small-scale local food producers to access new consumers; 2) providing a physical space for community food practises that empower communities via affordable access to local, sustainable, fresh produce, which doubles up as learning space for sharing food skills and social space for sharing and consuming food, e.g. a community café (Lewis, 2015; Food Exeter, 2019; Blake, 2019). Guzman and Reynolds (2019) found that food hubs adopted a range of operational approaches that depended on their assets and capacities, such as whether they had access to a physical space to run a hub from. Alternatively, telephone or increasingly virtual formats were deployed to link local food producers and consumers. Innovation in local food distribution is being trialled in the UK by a number of organisations at a range of scales including [The South West Food Hub](#), [Supply Devon](#), [Tamar Valley Food Hubs](#), with the aim of supporting small-scale producers to access new customer bases, including local authority procurers.

At the heart of a food hub approach is the idea that food is not only a question of provisioning but also entails other important social dimensions. Local and regional food hubs can provide jobs and economic security for local producers (Berti & Mulligan, 2016) as well as foster local food security and justice, which have been highlighted as challenges particularly during the COVID pandemic (Bellamy et al., 2021). Whereas food hubs focus on distributing food in an inclusive and just way, the community-supported agriculture model takes one step further by letting consumers participate directly in food production.

### Community-supported agriculture (CSA)

The CSA model has been around for many decades, allowing citizens and consumers to directly get involved with food producers (Hvitsand, 2016). CSA is an umbrella term for a range of so-called 'prosumer' models, enabling close collaboration between food producers and consumers. There are three main CSA types: a) shareholder CSAs which are formed and coordinated by members and hire a farmer; b) subscription CSAs, which are owned and coordinated by the farmer and invite consumers to participate; and c) cooperative CSAs that operate as non-profit social enterprises for the benefit of their members (Harmon, 2014).

CSAs are generally believed to increase in popularity, alongside box schemes and other local food initiatives, which has become particularly apparent during the COVID pandemic (Wheeler et al., 2020), allowing people direct access to local farms and their produce. CSAs create new social and geographically rich connections amongst producers and communities, which provide vital economic and social benefits (Brinkley, 2017). In some countries, such as France, there has been a deep seated culture of supporting small-scale, local producers, and hence CSAs, which in France are referred to as AMAP (association pour le maintien d'une agriculture paysanne; association for the support of peasant agriculture), have grown there

exponentially over the past twenty years, now involving more than 50,000 families (Peterson, Taylor & Baudouin, 2015).

CSAs can operate in different ways, ranging from more commercially focused businesses to models that favour cooperative approaches. Yet, they all entail long-term partnerships and risk-sharing between food producers and their consumers, which mostly live in close proximity to each other (Henderson & Van En, 2007). Consumers normally pay the producer a monthly subscription or some other form of medium to long-term commitment is established. This gives the producer economic security, which can sometimes extend to a full season. Producers get to know their customers, and often organise social events alongside, creating a close-knit community. Depending on the agreement, members of the community might help working on the land, particularly at harvest or other crucial times in the agricultural calendar. Often, entire families are involved, providing opportunities for children to learn about where food comes from and how it is grown. People also get vital access to the countryside and green spaces, which have reportedly improved mental health and well-being (Bharucha et al., 2020).

While CSAs can clearly experience ‘growing pains’ (Brinkley, Manser & Pesci, 2021), it is generally agreed that they can deliver human health, socio-economic and environmental benefits for participants, both on the producer and consumer side. Due to the close-knit communities that are created by CSAs, they can foster social connections amongst citizens as well as between producers and consumers like few other local food models (Espelt, 2020). As modern, hyper-competitive societies often struggle with social alienation and individualism (McDonald, Wearing & Ponting, 2007), CSAs can provide vital opportunities for rebuilding social fabrics and solidarity amongst communities (Diekmann, Gray & Thai, 2020). Economically too, CSAs can provide a lifeline for small-scale, local food producers who are often disadvantaged by a food system dominated by nationally and internationally operating supermarkets and food distribution companies (Shideler, Bauman, Thilmany & Jablonski, 2018). From an environmental perspective, CSAs often use agroecological, organic and other more sustainable farming techniques that have a much smaller ecological footprint than traditional food production methods (Espelt, 2020). The local nature of CSAs also means that carbon emissions tend to be lower than in traditional, supermarket-oriented food consumption (Little & Giles, 2020).

## Conclusions

Given the challenges faced by the global food system – producing manifold negative human, economic and environmental health outcomes – this chapter has argued that a shift to more diverse, regional food systems, which follow low-carbon, participatory and regenerative principles, would create multi-layered benefits. Based on a review of existing evidence, we have provided a blueprint for what we have termed a ‘regional circular food system model’ that operates according to three main principles: (i) closing loops and designing for effective and resilient systems; (ii) celebrating diversity through sharing, participation and cooperation; and (iii) place-based value retention and creation. We believe that the regional level is best suited for designing food systems along these principles, simultaneously delivering human, socio-economic and environmental health benefits. This is because a nested, circular food system creates multiple feedback loops that allow social, economic and ecological values to cycle within a region, compared to value being lost through long supply chains that are often wasteful and operate for the benefit of financiers rather than communities and places.

In this chapter we have outlined three specific institutional innovations that provide practical entry points to our model, namely community-supported agriculture schemes, food hubs and public food procurement partnerships. While in the UK and many other countries such and similar local food schemes have existed for a long time, we have argued that there is now a need to create a “new economic imaginary” by linking local, small-scale initiatives to larger institutions. We need a step change in the quest for the transformation of local food system. Our model of an integrated regional circular food system enables creative, locally embedded movements to become exemplars of new economic activity that brings to the fore human and environmental health.

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