

ADDRESSING THE FOOD SUPPLY CHAIN CHALLENGES FOR UK DISADVANTAGED COMMUNITIES

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Introduction

In pursuit of the United Nations (UN) Sustainable Development Goals (SDGs), many developed countries have invested various resources to address hunger as specified under the UN SDG2: Zero Hunger. Even in the West, there is a growing population of disadvantaged persons (such as single-parent households, low-income families, lone and vulnerable adults, the physically and mentally disabled, among others) who disproportionately suffer from diet-related ill-health, food insecurity and food poverty. The UK is no different. Despite various practical and research interventions, the role of logistics and supply chain management in addressing these challenges in the UK has been underexplored. Consequently, this research investigates the supply chains that deliver food to the disadvantaged to identify the processes, infrastructure and challenges, and to highlight ongoing attempts and propositions for addressing these.

The paper starts with a literature review of food waste and surplus food redistribution and food supply chain mapping in the UK. This is followed by a discussion of the data collection and analysis approaches for mapping the food supply chain serving disadvantaged consumers. The findings and discussions section presents an overview of the processes and infrastructure in the supply chain and presents recommendations for the various actors and stakeholders for process optimisation. The paper concludes with the research and practical implications.

Food Waste and Surplus Food Redistribution

Increasingly, global awareness of the excessiveness and avoidance of food waste has become far-flung as environmental and community sustainability concerns have gained priority. Owing to varying definitions of food waste as well as the different methods of measurement (Facchini *et al.*, 2018), the quality of data on the volumes of waste is low. Notwithstanding, there is consensus that unprecedented quantities of edible food go waste annually (Bourlakis *et al.*, 2014). This waste occurs significantly higher upstream of the food chain in developing countries due to technical, financial and infrastructural constraints at the production, post-harvesting, distribution and storage levels within the food system (Godfray *et al.*, 2010). In developed countries where such challenges are not as pronounced, food waste tends to result from wasteful practices downstream of the supply chain throughout retailing, the hospitality and catering industry and especially in households (Vlaholias *et al.*, 2015).

To mitigate the excessive waste, various attempts have been made to intervene. Predominant among these is the redistribution of surplus food. As it is not the waste that is redistributed, it is important, both from an academic and social perspective, to differentiate between surplus and waste. Food waste may thus be considered as both edible and inedible food that gets discarded at various stages of the food supply chain. Surplus food, on the other hand, is the edible food which is safe for human consumption but may end up as supererogatory due to a variety of failures (such as overproduction, mislabelling, consumer ignorance, logistical errors, order declines, unnecessarily stringent quality and cosmetic requirements etc) within the food sector (Midgley, 2020). In developed countries, a lot of such surplus food go waste. For example, over 9.5 million tonnes of food and drink were wasted post-farmgate in the UK in 2018 (Parry *et al.*, 2020). Paradoxically, the levels of food insecurity and food poverty are

increasing in the country, as evinced in the exponential rise in the reliance of people on food banks by approximately 300% in the last decade (Lovell and Eatwell-Roberts, 2019). The UK's exit from the EU, the COVID19 pandemic and the Russian-Ukrainian conflict have all further exasperated the situation. These conditions have made urgent the need to effectively redistribute as much surplus food for human consumption as possible.

In 2006, the UK government, through its Department for Environment, Food and Rural Affairs (DEFRA), recognised in its 'Food Industry Sustainability Strategy' report the possibilities of surplus food utilisation to attain holistic sustainability benefits (DEFRA, 2006). DEFRA and the Waste and Resources Action Programme (WRAP) have thus promoted surplus food redistribution for many years (Papargyropoulou *et al.*, 2022). Regardless of this governmental support, only a very small portion of redistributable food in the UK is redirected for human consumption (Facchini *et al.*, 2018). Despite redistributing almost twice as much food in 2018 (55,857 tonnes) as in 2015 for human consumption, about four times this quantity went to animal feed alone in the same year (WRAP, 2019). This shows the priority ranking adopted by the government in its food and drink waste hierarchy (FDWH) is not being adhered to.

In reviewing the discussions on food waste and redistribution, the potential for optimised supply chain interventions has been underexplored. Much of the literature has focused on the disadvantaged consumer, the causes of their dependency on food aid and the appropriateness of redistribution as a sustainable solution. Despite the importance of these discussions, the prescribed means for not wasting edible food is through redistribution. It is thus important to investigate how best to expedite this as the current rates and volumes of redistribution in the UK are unacceptable. This study employs supply chain mapping to better understand the processes and infrastructures within the supply chains that serve disadvantaged communities and to propose means for improvement from a supply chain perspective.

Food Supply Chain Mapping in the UK

Food supply chains, like many other supply chains, are facing a wider variety of risks (for food businesses and consumers alike) as their expanse and complexity have increased with globalisation. Supply chain mapping has been useful for risk mitigation, resilience and sustainability (Donaldson *et al.*, 2020; Mubarik *et al.*, 2021; Sawyerr and Harrison, 2020). Following the introduction of value stream mapping into the mapping of supply chains, there has been a better understanding of supply chain entities and the relationship dynamics between them to facilitate operational and strategic performance improvement (Barroso *et al.*, 2011). Of the various approaches adopted for mapping food supply chains, food value chain analysis (FVCA) has been among the most utilised methods in the UK. Borrowing from the principles of lean production, value stream mapping and value chain analysis, the method has been applied to several agri-food sectors. Many authors (such as Donaldson *et al.*, 2020; Francis *et al.*, 2008; and Simons *et al.*, 2003) have applied the method or variations of it.

Kumar *et al.* (2013) adopt a variation of FVCA to identify the drivers and changing patterns in the UK food supply chain structures. Data collection from publicly available reports and literature reviews was used to determine the key actors and stakeholders in the UK food supply chain for selected products, their roles and their influence within each chain. With this data, the 'basic map' of the chains was developed. Then, semi-structured interviews with representatives from the various actors in the chains facilitated the development of the actual or 'Big Picture' maps of the food chains based on which opportunities for integration and improvement were highlighted. A similar approach to data collection and analysis is adopted to map the supply chains that serve disadvantaged communities in the UK and to identify solutions and propositions for improvement.

Methodology

Having examined the relevant literature and government documents on the UK commercial food supply chain, the “basic map” showing the structure was designed using a relationship-based supply chain mapping approach. Thirty-two participants were then interviewed based on the actors identified in the basic map. These included key actors from each stage of the supply chain. There were three primary producers, five manufacturers, four retailers, a wholesaler and three logistics companies. Additionally, two industry experts, two government officials and five experienced academic professionals were also interviewed. From these interviews, other actors who facilitate food redistribution to disadvantaged groups were identified and interviewed. They included two food aid service organisations and five food aid wholesale distributors. The resultant data were then analysed through an abductive thematic analysis method using NVivo 12 Plus. Its matrix query coding function facilitated the mapping of the current state of the food supply chain, the actors, relationships, infrastructure, and processes involved at the various stages of the supply chain to supply food to disadvantaged communities in the country.

Findings and Discussions

Processes and Infrastructure

Our findings indicate that the supply chain that serves disadvantaged communities is a conflux between the commercial food supply chain (CFSC) and the food aid supply chain (FASC). The CFSC consists of primary producers, manufacturers, wholesalers, retailers, the hospitality and catering industry and logistics companies (LC) while the food aid or redistribution chain consists of food aid wholesale distributors (FAWD) and food aid service organisations (FASO). The actors in the CFSC serve as the suppliers or donors of the food (usually surplus but also donated food which is not surplus) to food redistributors (FAWDs and FASOs). The FAWDs collect donated food (or sometimes buy at discounted prices) in high volumes from the large actors in the CFSCs and supply these to the FASOs. FAWDs own trucks, warehouses and distribution facilities from where collected food is processed, repackaged (if need be) and distributed to FASOs at discounted rates. FASOs also access additional donated food from CFSC actors locally – albeit in smaller volumes and usually from their retail outlets or farms. Disadvantaged consumers then access the surplus food through the FASOs as cooked food in food banks, food parcels delivered to homes or bought food items through social retail outlets or membership schemes. Usually, the food accessed through the FASC is supplemental to what they can afford through the CFSCs. Other stakeholders who do not typically participate directly include central and local government, academics, relevant associations, and the media.

Addressing the Challenges in Food Redistribution

Being a form of a humanitarian supply chain, the food aid supply chain suffers from the ills of the differing and often misaligned motivations of different actors in the supply chain (Kovács and Spens, 2007; Midgley, 2020). This leads to a myriad of challenges, especially as there is no ‘focal’ company in the supply chain driving the attainment of specific goals across the chain. In this study, some of the challenges identified included the limited resources and capacities of food redistributors, difficulties in identifying unique community needs, the quality and appropriateness of donated food, the disorganisation and severe lack of collaboration in FASCs and social costs – all of which align with those previously identified (Vlaholias *et al.*, 2015). In addition, inadequate expertise, process and resource inefficiencies with the FASC, restrictive government legislation and company policies, food perishability, the lack of awareness about food redistribution as well as the logistical cost of redistribution and associated processes across the food chain were also identified.

A plethora of ongoing attempts and propositions have been made to address these issues. However, we present five of the most highlighted interventions that could help improve supply chains that serve disadvantaged groups. These may be summarized as the need for better

collaboration, improved operational efficiency, increased economic incentives, improved livelihoods and support systems, and education, training and awareness creation. Each of these and how they differ based on the actor within the supply chain is presented in Figure 1 and discussed below.

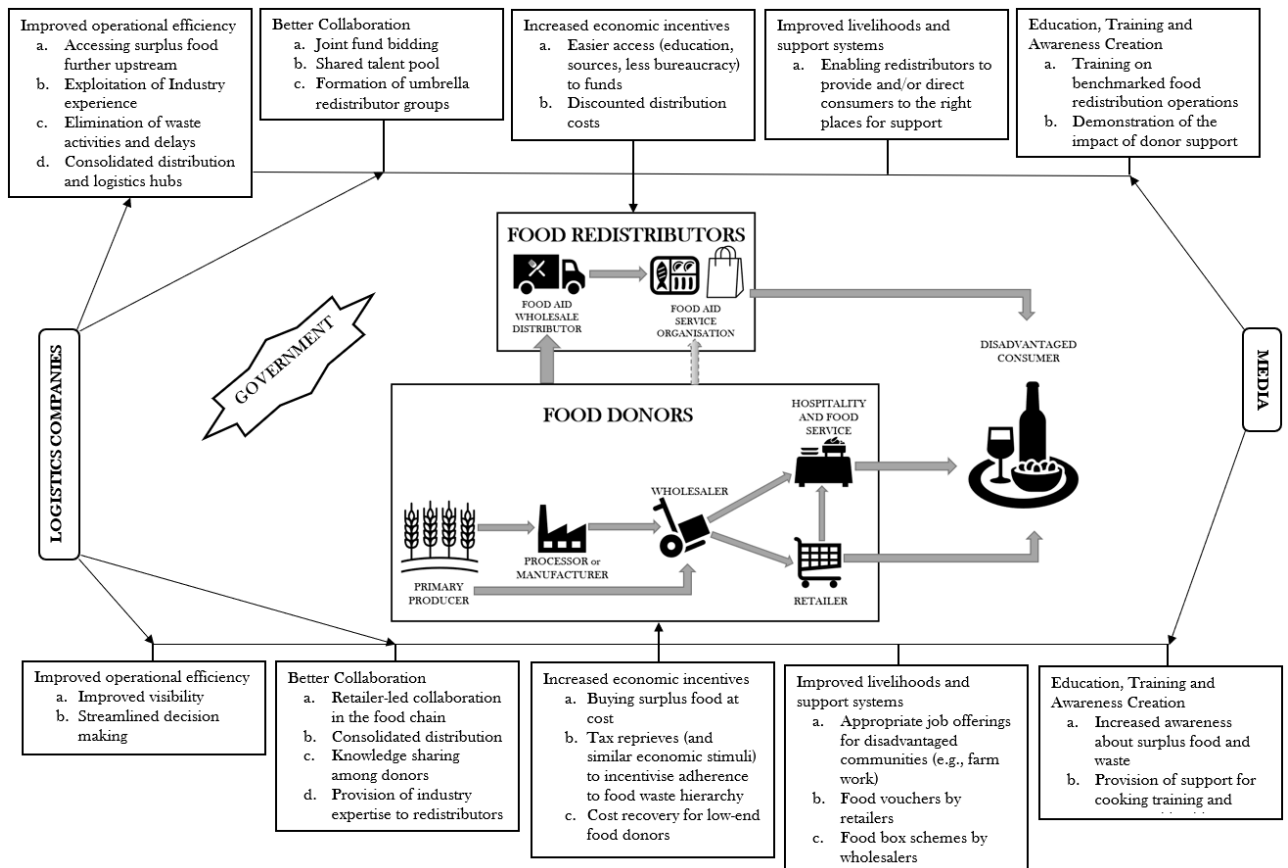


Figure 1: Active and/or proposed solutions for addressing the food supply chain challenges for disadvantaged communities in the UK

Better Collaboration

Quite consistent with the challenges that plague food redistribution due to misaligned motivation of actors, the need for better collaboration across the sector, despite some progress in this regard over the past few years, was highly cited by the interviewees. On the part of food donors, the most powerful actors in the food chain – retailers (Bourlakis and Weightman, 2004), can drive greater collaboration across the chain by leading on knowledge sharing, consolidated distribution and encouraging their suppliers to pursue food redistribution. For the redistributors, the formation of umbrella bodies was proposed as a powerful tool to foster awareness and drive collaboration, especially among FASOs as that part of the FASC is heavily fragmented. These organisations could then have better access to funds by bidding jointly and could improve on their operational expertise by sharing common talent pools.

To address the quality and inappropriateness of some donated food, donors must communicate better with redistributors to identify and meet the needs of the intended recipients. As one of the interviewees from the retailing sector pointed out: “*When we devised the shopping list, one of the big requests was ‘please no more baked beans’... And actually, that’s more a thing of supply and demand, as they’re overwhelmed by baked beans.*” Seeing talent recruitment and retention is a challenge in this sector (Overstreet *et al.*, 2011), finding collaborative means to exploit industry expertise from CFSC partners to improve process efficiencies can be helpful. Large donors could also help redistributors through funding and infrastructural support.

Improved Operational Efficiency

The FASC is rife with wasted resources and time due to very high levels of inefficiencies. Operations between food donors and redistributors could be improved by standardising the food redistribution model. Some have suggested that instead of dealing with surplus, organisations have to improve on their processes to reduce surplus to zero so that they can instead donate economically viable percentages (say, 0.5%) of their range of high-quality products to redistributors as part of their corporate social responsibility (CSR) activities. However, this proposition can only be operationalised when companies have succeeded in cutting away the sources of waste and surplus in their supply chains.

A more immediately achievable proposition is to equip redistributors to be responsible for implementing the FDWH whereby companies in the CFSC pay for the FAWDs to collect all waste and surplus food from them. These redistributors would then be responsible for redistributing the edible food for human consumption, sending the remainder to animal feed, anaerobic digestion (AD) and further down the FDWH until the unusable food ends up in landfills. Food donors could then claim to be more environmentally and socially responsible, and they could invest in the requisite logistical systems that would facilitate these operations with FAWDs. This could lead to better organisation in the distribution channels that serve disadvantaged communities and relieve donors of the responsibility of dealing with several different charities in different locations. The CEO of one of the FAWDs interviewed was seriously considering this: *“So one of the things we do need to really think about is how we become a one-stop shop. How can we work with waste management companies and how can we work with anaerobic digestion and animal feed and everything else, so that we’ve got an hierarchy of things that we can do. So we can say yes to the industry and then create the most social and environmental value through a filtering system.”*

Until such propositions can be fully operationalised, current operations can be improved through the use of logistical hubs and consolidated distribution where donors could share delivery vans to deliver to FAWDs and/or FAWDs could use the distribution vans of donors through route optimisation. Improving visibility in the chain so that donors can declare the type, volume and location of surplus food for redistributors to collect and use appropriately will be helpful. This is ongoing with apps such as Olio, Too Good to Go and others but this could be further improved. Lean supply chain principles can also be applied to eliminate waste activities, delays and unnecessarily bureaucratic decision-making processes relating to surplus food (particularly in donor organisations).

Increased Economic Incentives

Despite the moral appendage to food redistribution, when that option becomes economically prohibitive, many donors look elsewhere (such as AD and animal feed) to send their surplus food (Papargyropoulou *et al.*, 2022). Evidence from interviews suggests that donors (especially as one moves upstream) prefer bypassing the redistribution for human consumption stage of the FDWH, as the animal feed and AD options are more economically rewarding and less resource-taxing. The government must reverse its unintentional incentivisation of the non-adherence to the FDWH due to its support for AD. Suggestions include cost recovery for low-end donors by paying for the resources required to harvest and ready surplus food, buying surplus food at discounted prices and subsidising or payment by the government for the cost of distributing surplus food.

Logistical costs for redistribution were highlighted by multiple actors across the supply chain. One of the interviewed primary producers explained that: *“It comes down to money, doesn’t it? They [government] could potentially support local hubs to facilitate distribution really or collection or just the organisation of that. I think most major companies like ourselves, would deliver to the said hubs. But it’s from there on. I think these organisations [redistributors] need some financial assistance.”* Logistical companies, even though are willing to support, highlight

that energy and labour costs and labour shortages inhibit the help they can offer. Interviewees emphasised the need for governmental intervention.

Improved Livelihoods and Support Systems

From a long-term, more sustainable perspective, interviewees indicated that improved livelihoods and the provision of relevant support schemes for the disadvantaged will help address the root cause of food insecurity and poverty. The governmental support and collaborations with FASOs to provide relevant counselling, guidance and support for aid recipients must continue and become more widespread. This will ensure repeat visits to FASOs will be on the decline rather than the increasing rate. Support schemes such as food vouchers and box schemes by retailers and wholesalers can help provide aid recipients with choice, thereby reducing the social cost for them. Furthermore, there may be job opportunities within CFSCs that disadvantaged groups could fill to support their household incomes. An interviewed primary producer explained that *"I've been reliant on European workers and now I can't get European workers, but the accommodation is still there. So people could move from the city for the fruit season for six months, earn a living, and move back to the city. These opportunities are there if people want them... We've got what? 2 million people unemployed in the country at the moment and there's probably 2 million jobs in the countryside waiting to be filled. So it's how do we get those two to marry up? How do we create the housing head or create the mobility, how do we create the awareness that you can actually earn a good living in agriculture?"*. Some sort of government intervention is required to facilitate this.

Education, Training and Awareness Creation

Our findings also indicate a lack of awareness about food redistribution, the organisations involved in it and its economic, social and environmental sustainability benefits. Some potential donors underestimate the difference their surplus could make. A representative from a FAWD pointed out that *"...everyone has waste, everyone has surplus, so a 0.01% waste for a business still might be 1000 tonnes of food, which can still make a huge amount of difference. So what's nothing to them might be huge to the not-for-profit community."* Indeed, even among redistributors (particularly FASOs), there is limited understanding of the complexities involved in the operations of the FASC further upstream. Training on benchmarked food redistribution operations can help address some of the inefficiencies in the FASC. The media as well as redistributors can increase awareness by destigmatising surplus food to help address the social cost to beneficiaries and also demonstrate the impact of donor interventions. One of the challenges raised by some donors with the type of food to be donated was the recipients' (both FASOs and the consumer) ability to cook it. Donors can increase awareness across the food chain and provide support for cooking training and nutritional health training while the media and redistributors can help provide cooking lessons and recipes on food products that usually get donated.

The Critical Role of Logistics Companies and Government

Having identified logistics and associated costs as a major challenge across the FASC, thereby confirming Alexander and Smaje's (2008) findings, the study explored with LCs the role they could play in food redistribution beyond giving discounted rates to large FAWDs and fulfilling their customers' requests to deliver to redistributors. Findings indicate that LCs occupy a strategic position in CFSCs whereby clearly defining their role in food redistribution could help address numerous challenges in the sector. As these organisations provide storage and distribution services for multiple large retailers and manufacturers, they could easily handle early identification of surplus food, consolidate the distribution from multiple donors to redistributors, improve visibility of the food redistribution chain, reduce procedural complexity and eliminate waste activities and delays upstream of the FASC. The LCs highlighted bureaucratic decision-making processes by their customers as the main cause of delays in processing surplus food in their care. Should these processes be streamlined, the remaining shelf life of products will be longer and this will afford FAWDs some time to handle distribution to FASOs and reduce the pressure to urgently use these products. The collaboration among

multiple donors and between LCs will make the handling and redistribution of surplus food more cost-effective. Discounts from the LCs (as their CSR) along with the food donor and government support could help cover the associated costs. To operationalise this, the government can pilot this with an LC, some donors and redistributors. Once the process gets streamlined and effective, it could then be extended for broader implementation.

Overall, most of the interventions proposed require a governmental role either locally or centrally. The UK government must lead a sector-wide collaboration drive in food redistribution, help increase the economic incentives for it, lead the provision of support systems and improved livelihood for the disadvantaged, ensure equitable fund distribution among food redistributors and implement policies to drive nutritional health education and food redistribution.

Conclusion

This study has explored the supply chain that serves disadvantaged communities and identified some supply chain interventions to optimise food redistribution and adherence to the UK's FDWH. This has research and practical implications. The insights presented here provide a better understanding of the nuances in the food chain that serves disadvantaged communities in the UK and provides suggestions on how challenges may be addressed. There is an opportunity for deeper analysis of implementation strategies, trade-off analysis, exploration of the sustainability costs and benefits in implementing various solutions and the specific interventions required at the various stages of the supply chain. Practically, the pursuit of these can help the UK's efforts at achieving the UN SDG 2 (Zero Hunger) within its borders and present a framework for addressing food insecurity and poverty challenges in the West.

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