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Title:

Beyond calorie counting: Assessing the sustainability of food provided for public consumption

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Abstract

Food consumption outside home is a growing phenomenon that is rapidly gaining in importance in terms of its impact on both consumers and the food system. This paper presents an innovative tool for measuring the sustainability of food intended for public consumption in organizations such as schools, hospitals and workplaces. Drawing on an in-depth review of the food sustainability literature, the FOODSCALE method quantifies 11 sustainability categories which together cover 36 food sustainability indicators. A number of characteristics distinguish the FOODSCALE method from other food sustainability assessment tools. First, it covers the three dimensions of sustainability – society, economy, environment – treating these as interdependent and coexisting. Secondly, it considers the entire food system, thus incorporating aspects of production, distribution, procurement, consumption and waste disposal. Cross-cutting themes of health and human agency complement the 11 specified categories to present a holistic assessment of food sustainability. The tool helps to identify both good practice and areas for improvement and points towards specific measures for increasing food sustainability. Following a detailed discussion of the tool, the paper presents results of a comparative study of 8 cases across 5 organizations in the Republic of Ireland.¹ Results show significant differences in sustainability performance across cases and within organizations. The role of key decision makers in organizations and possible points of intervention are highlighted in the discussion. The research demonstrates the potential of the FOODSCALE method for assessing the (un)sustainability of food intended for public consumption. Building on theoretical insights from the alternative food systems literature, the paper emphasizes the central role of organizations in supporting (un)sustainable food systems and highlights potential pathways toward more sustainable food procurement and provision. The paper makes a major contribution to the advancement of empirical research on the social, economic and environmental impacts of food provision in large-scale organizations.

Keywords:

Public food consumption; organizations; sustainability assessment; FOODSCALE method

1. Introduction

Sustainability challenges occur throughout all stages in the food system from production through processing, distribution and retailing to consumption and waste disposal. Global food production is higher than ever before, but at a great cost. A host of environmental problems such as greenhouse gas (GHG) emissions, deforestation, desertification, eutrophication and biodiversity loss are exacerbated through current food system activities (Garnett, 2011). Moreover, economic globalization has increased people's dependency on both local and geographically distant food systems. Food insecurity is growing worldwide due to the heightened

¹ Henceforth Ireland.

interconnectedness and complexity of these systems and, consequently, their susceptibility to disturbances and interruptions, including unpredictable weather patterns associated with climate change. All in all, the global food system fails to effectively carry out its primary function – to provide adequate nutrition for all people. Some people eat too much food whilst others go hungry, including many small farmers in developing countries. Diet-related diseases are prevalent among all populations, often for different reasons, but nonetheless at a great cost to society (McMichael et al., 2007). The rapid depletion of key natural resources such as oil, arable land and water further compounds the difficulties in achieving a sustainable food system. Additionally, greater prosperity, population growth and rapid urbanization make food-related challenges increasingly urgent, with increases in food demand over the next 30-40 years estimated to be as high as 70-100 per cent (FAO, 2009).

To address these sustainability challenges, the food system must substantially increase output and simultaneously reduce its negative environmental impact. Food prices need to be kept at a level that allows producers to earn a decent living while keeping nutritious food affordable and accessible for all consumers. To reconcile these three goals demands a radical transition towards a food system that is productive, resource efficient and able to cope with internal and external shocks, supports livelihoods, and protects the environment (Godfray et al., 2010). This requires concerted effort across all sections of society and by actors at all stages of the food system, including producers, processors, distributors, consumers, policy makers and others (Spaargaren et al., 2012). A focus that goes beyond technological innovation and individual consumer responsibility incorporating a holistic long-term vision is needed (Sage, 2012). In this regard, one area where intervention can exert influence on the food system is the sphere of public food consumption, that is, food that is eaten outside home. Public food consumption is recognized as an area of increasing importance, particularly in industrial nations, due to its direct and indirect social, environmental and economic impacts and its significant influence on the wider food system (Wahlen et al., 2012).

The remainder of the paper is divided into 6 parts. After an initial discussion of the sustainability challenges associated with public food consumption in organizations in Section Two, the FOODSCALE method is introduced and discussed (Section Three). The development and testing of this tool receives attention in Section Four. Section Five details the application of the FOODSCALE method in 5 Irish organizations and compares their respective scores. This is followed with a discussion (Section Six) and short conclusion (Section Seven). Overall, this paper seeks to make a major contribution to the sustainability assessment of food offered in organizations.

2. The (Un)sustainability of Public Food Consumption

There are many factors which contribute to consumers' decisions to eat out including higher incomes; more female participation in the workforce; greater choice; increased work pressure

resulting in longer working hours; and lack of skills, time or energy to prepare food (Davies et al., 2014). At the same time, a wide variety of eating out options and strong market competition across the choice spectrum have led to substantial variance in the type and quality of food offered in highly developed countries. Traditional eateries such as restaurants, cafés and hotels now find themselves in competition with more recent entries into the pre-prepared food service market such as newsagents, convenience stores and gasoline service stations. Takeaway and fast food outlets, food markets and public houses serving food further increase consumer choice for eating outside home.

For many the choice of eating options is considerable, for others, they have little option but to eat away from home. Hospital in-patients, prisoners, nursing home residents and school boarders are generally more limited in their food consumption choices. When and what they eat is influenced to a great degree by the choices of others. Other large-scale food preparation sites such as those at schools, universities, workplace canteens and other in-house catering typically provide food for employees, students or other affiliated consumers. Worryingly from a public health perspective, foods eaten outside home tend to be less healthy compared with food prepared at home (Orfanos et al., 2007).

As well as providing a large proportion of the population's food energy intake, the food service sector is a large employer generating substantial direct and indirect employment, particularly in food production, processing and distribution, and has a notable impact on the environment through its food procurement, preparation and waste disposal activities. Among the operational activities of food service, it is food procurement that generates the greatest environmental impact (Baldwin et al., 2011) owing to its influence on the production and distribution of food. Here, large public and private organizations are thought to occupy a strong position to support sustainable development and improve the local economy through sustainable sourcing while also creating spillover effects into private households (Walker and Preuss, 2008; Wahlen et al., 2012).

Within the food services sector, catering professionals, food procurement officials and chefs are in positions of responsibility and influence, they continually make decisions that help to shape, guide and control the food system. Exposing the linkages between food production, procurement and consumption is critical to understanding how the dynamics of supply and demand at these intersections impact on the wider food system. These complexities raise major questions regarding the (un)sustainability of food systems and its measurement. While an in-depth treatment of this debate is beyond the scope of this paper, it nevertheless seems prudent to briefly outline three key points.

2.1. Reconciling the three dimensions of sustainability?

Many food sustainability concepts and measurement tools have equated sustainability with sounder environmental practices, such as a reduction in GHG emissions, thereby ignoring major

societal and economic aspects of sustainable food (Morgan, 2008). The widespread practice of equating sustainable food with more environmentally friendly food ignores the substantial trade-offs that occur between social, environmental and economic factors in the food system and the contextual considerations of food sustainability (Lozano, 2008). Food with a lower environmental impact is not necessarily more sustainable than food that might be more environmentally unfriendly but brings greater overall benefits to wider society. For example, environmental efficiencies can be achieved through large-scale production, but support for small-scale producers may better contribute to rural economies and vibrant local communities. The FOODSCALE method presented in Section Three addresses this issue by treating environmental, economic and social sustainability issues as interrelated aspects of the food system that may or may not be compatible.

2.2. Defining sustainable food

There is no agreed definition for what constitutes sustainable food, thus making it difficult to measure and quantify. Nevertheless, a number of tangible characteristics reflect greater sustainability and are captured in the FOODSCALE method (see Section Three). These include protecting biodiversity; promoting animal welfare; avoiding negative environmental impacts; providing safe, healthy food; educating and connecting consumers with the food they eat; reflecting seasonality and culture; being socially inclusive by being available, accessible and affordable to a wide range of people; contributing to resilient local economies and supporting sustainable livelihoods through fair prices, good working conditions and fair trade both at home and overseas.

2.3. Is local always better? Difficulties in defining local and regional food systems

Advocates for a local or regional food approach argue that re-localizing the food system will bring a number of related benefits in comparison to conventional industrialized agriculture. However, a departure from a simplified 'local equals better' logic is urgently needed. Local food systems may be sustainable or not, just as globalized food networks can produce various outcomes depending on the desired goals and strategy employed by agents (Born and Purcell, 2006). Similarly, desirable outcomes such as social justice or economic feasibility cannot be presumed to be inherent to local food systems (Kneafsey et al., 2013). Therefore measuring the sustainability of food requires going beyond merely looking at distance to include additional criteria such as production methods, supply chains and community engagement. Nonetheless, despite criticism of local and regional food concepts, sustainable food procurement typically involves purchasing local, organic and fairly traded products from at home and abroad (Morgan and Morley, 2014). Local and regional food systems form a central part of the sustainable food narrative and have the potential to foster a more sustainable food system (Marsden and Morley, 2014).

Without legal definitions for local or regional food, understanding of these concepts is largely subjective and context dependent. Criteria used to delineate local food systems include those based on distance, referring to a defined radius from origin to the point of sale or consumption (Kneafsey et al., 2013). Others utilize an existing administrative boundary such as a county or geographical area. In some cases, local and national are conflated by producers, consumers and food promoters (Carroll and Fahy, 2014). In a recent Irish-based study, the understanding of local by some chefs was extended to include speciality foods from other European countries (Duram and Cawley, 2012). In this instance, the concept of local is less concerned with geographical distances or boundaries and more associated with inherent qualities of the food such as artisanal production techniques. Defining regional food is equally problematic (Donald et al., 2010). Nonetheless, devolution of decision-making power to regional institutions can facilitate the conditions necessary to allow regions create place-specific strategies to develop regional food networks (Kneafsey et al., 2013).

3. The FOODSCALE Assessment Tool

Motivations behind decision-making and attitudes towards sustainable food can be effectively explored through qualitative data, however there are limitations in terms of quantifying the impact of these decisions. These limitations can be addressed through quantitative measurement of specific areas where increased sustainability can be realistically achieved.

Following a critical review of the food sustainability literature more generally, and publications on food sustainability assessment in particular, a new and innovative quantitative assessment tool for measuring the sustainability of food provided through food outlets and within organizations was developed. The FOODSCALE method considers social, economic and environmental factors (Table 1) as well as production methods (supply side) and consumption patterns (demand side). It thus differs significantly from established sustainability assessment tools that have been applied to food systems across different geographical scales ranging from the local to the global. Quantitative techniques such as life-cycle analysis (e.g. Baldwin et al., 2011; Notarnicola et al., 2012; Del Borghi et al., 2014), material flow analysis and food miles calculators (e.g. Pretty et al., 2005; Avetisyan et al., 2013) have tended to focus solely on environmental issues, thereby reflecting a rather narrow understanding of sustainability (cf. Rau and Fahy, 2013 for a more general discussion of sustainability concepts and their social-scientific and interdisciplinary investigation). To widen the scope of sustainability assessment beyond environmental concerns, to include key economic and social aspects in relation to food on offer in organizations, was a major goal of this research.

The choice of indicators included in the tool closely mirrors themes in the food sustainability literature. In particular, the 11 categories included incorporate the 'seven principles of sustainable food' identified in Sustain's (2007) report 'Serving up sustainability: A guide for restaurants and caterers on how to provide greener, healthier and more ethical food'. The

document offers guidelines to businesses for adopting a sustainable food approach that includes using local, seasonal, organic and Fairtrade-certified products; reducing the amount of meat served; avoiding at risk fish species; serving tap water instead of bottled water; and promoting health and wellbeing. In addition to measuring the seven principles, the FOODSCALE method also incorporates indicators for food waste, interaction with consumers, and engagement with small producers and local communities.

3.1. *How the FOODSCALE method works*

The FOODSCALE method is intended to be used by different academic and non-academic actors in the food sector, which is reflected in its accessible and user-friendly structure. It deploys a points system ranging from 0-100, only using integers to make the results easy to understand and to enable comparisons both within and between cases. The maximum score of 100 points is distributed across 11 categories and 36 indicators. Each of the 11 categories are weighted to a maximum score of 5, 10, 15 or 20 points, with scores for each indicator ranging from 6 to 1. Higher scores indicate greater sustainability (see column 1 in Table 1 for details). Greater weight is given to categories that are deemed to have a higher impact on overall food sustainability and that reflect a positive attitude towards providing healthy, sustainable food for consumers, combined with a significant commitment to change. The application of weights to different indicators was based on a number of factors including an extensive review of relevant literature, 25 qualitative interviews with food experts, as well as an iterative process of data collection adjusting during the development and pilot phases. Food origin is allocated a maximum of 20 points to reflect the high social, economic and environmental impact of food supply chain structures (Kneafsey et al., 2013), with higher marks indicating shorter supply chains. The allocation of 15 points to meat recognizes the significance of meat production and consumption, especially of red meat, for food sustainability (Chemnitz et al., 2014). Categories allocated 10 points include those dealing with community and consumer engagement, food waste and use of organic produce. The remaining 5 categories – seasonal, fairly traded, fish, eggs and water – are given 5 points each. Further information on each of the main categories and their relative importance in food sustainability is provided below.

3.1.1. *Organic certified food (10 points):*

Organic food is produced with limited use of artificial chemical fertilizers, thereby reducing the dependency on fossil fuels associated with conventional agriculture. Soil health is maintained through the use of natural fertilizers and strategic crop rotation and diversification, contrasting conventional monoculture farming. The restricted use of synthetic fertilizers, pesticides and antibiotics helps to protect biodiversity and avoid water pollution through leaching or the spread of antibiotic resistant bacteria through routine use of antibiotics. The organic movement is built around a strong connection between people and the land and promotes high ethical and animal welfare standards (Morris and Kirwan, 2011). However, as organic agriculture becomes more commercialized, and consequently mechanized, the distinction between the pioneering organic

movement and modern industrialized agriculture has become somewhat blurred (Klintman and Boström, 2012).

FINAL DRAFT

Table 1: Social, environmental and economic rationale for the FOODSCALE method and indicators used to assess food sustainability

Categories	Social Impacts	Environmental Impacts	Economic Impacts	FOODSCALE Indicators
1. Organic (10 points)	<ul style="list-style-type: none"> High ethical and animal welfare standards Greater bio-diversity and crop diversification Societal health benefits from restricted use of antibiotics Facilitates social connectedness and personal relationships 	<ul style="list-style-type: none"> Avoids use of artificial chemical fertilizers leading to lower environmental impact Restricted pesticide use protects bio-diversity Greater crop diversification 	<ul style="list-style-type: none"> Reduces external costs to society associated with conventional food systems Fulfills growing demand for organic produce 	<ul style="list-style-type: none"> ✓ Percentage of total food organic certified ✓ Percentage of fruit and vegetables organic certified
2. Seasonality (5 points)	<ul style="list-style-type: none"> Fresher/less processed food Increased food security Supports traditional food; techniques and culture Fosters educational relationships between growers and consumers 	<ul style="list-style-type: none"> Reduces need for chemical treatments to increase shelf-life Decreases energy used for storage Lower transport emissions Food produced with nature's natural rhythms 	<ul style="list-style-type: none"> Reduces transport, storage and packaging costs Facilitates local producers to provide food all year round Creates more resilient farming system Importation of out-of-season produce narrows balance of trade 	<ul style="list-style-type: none"> ✓ Changing menus to suit seasons ✓ Displaying a seasonal food calendar for the region ✓ Growing own herbs/vegetables
3. Fairly traded produce (5 points)	<ul style="list-style-type: none"> Improved well-being for farmers in developing countries Minimum health and safety standards enforced Investment in social and business development Reduces child labour 	<ul style="list-style-type: none"> Minimum environmental standards enforced Sustainable farming methods promoted Investment in environmental projects 	<ul style="list-style-type: none"> Greater access to overseas markets for poorer farmers Guaranteed minimum price for farmers Potential to lift poor farmers out of poverty 	<ul style="list-style-type: none"> ✓ Using fairly traded coffee, tea and bananas

	<ul style="list-style-type: none"> Builds alliances among small-scale producers 				
4. Meat (15 points)	<ul style="list-style-type: none"> Reduced meat consumption benefits human health Certification maintains high animal welfare and health and safety standards Less intensive farming and routine use of antibiotics reduces spread of zoonosis and other diseases 	<ul style="list-style-type: none"> Reduces GHG emissions Discourages deforestation for meat production Prevents soil damage due to overgrazing and loss of biodiversity caused by intensive animal farming Certification to a quality assurance scheme that incorporates environmental standards 	<ul style="list-style-type: none"> Low conversion rate from grain to meat results in high production costs Increased consumer demand for fully traceable and certified meat products 	<ul style="list-style-type: none"> Percentage of total food and drink budget spent on meat Percentage of total meat budget spent on red meat Animal welfare certification for meat products Percentage of main course dishes containing meat 	
5. Sustainably sourced seafood (5 points)	<ul style="list-style-type: none"> Protects source of food and livelihood for millions of people Addresses animal welfare concerns associated with intensive aquaculture Prevents displacement of poorer coastal communities for aquaculture developments 	<ul style="list-style-type: none"> Protects against overfishing; catching of non-target species and marine biodiversity loss Prevents damage to coral reefs and other sensitive habitats (especially due to bottom trawling) Responsible fish farming can prevent disease and parasites (e.g. sea lice) Discourages destruction of important natural habitats for aquaculture development 	<ul style="list-style-type: none"> Discourages illegal and unregulated fishing that undermines markets Responds to increased consumer demand for sustainably produced fish 	<ul style="list-style-type: none"> Seafood sourced from recognized accredited scheme which incorporates sustainability 	
6. Eggs	<ul style="list-style-type: none"> Organic and free- 	<ul style="list-style-type: none"> Organic and free-range 	<ul style="list-style-type: none"> Higher returns for 	<ul style="list-style-type: none"> ✓ Type of egg used (e.g. 	

(5 points)	<ul style="list-style-type: none"> range eggs produced to higher animal welfare standards Higher quality produce increases taste and flavour Quality Assurance Scheme accreditation ensures health and safety standards 	<ul style="list-style-type: none"> eggs produced to higher environmental standards Quality Assurance Scheme accreditation maintains environmental standards 	<ul style="list-style-type: none"> Producers responds to consumer demand for higher quality produce 	<ul style="list-style-type: none"> organic, free-range, regular, bottled) Traceability and quality assurance
7. Water (5 points)	<ul style="list-style-type: none"> Healthy alternative to sugary drinks High cost (of bottled water) may deter consumers from drinking water Tap water highly regulated and safe to drink 	<ul style="list-style-type: none"> Drinking tap water reduces environmental impact of bottled water including production, transport and disposal costs Locally bottled water has lower transport emissions 	<ul style="list-style-type: none"> Bottled water more expensive than tap water Eliminates waste costs for disposal of plastic bottles Supplying locally bottled water contributes to local economy 	<ul style="list-style-type: none"> Source available for customers (e.g. filtered water free of charge, tap water, bottled water only) Origin of bottled water
8. Food waste (10 points)	<ul style="list-style-type: none"> Lower food waste increases food security Minimizing use of oils and fats reduces waste and leads to healthier food Food waste reduction initiatives raise awareness and can lead to healthier eating habits Unused food can be donated to feed people and reduce waste Waste prevention initiatives can increase communication 	<ul style="list-style-type: none"> Reducing food waste also reduces environmental costs Food waste can be recycled to produce compost, fuel or animal feed Raises awareness of environmental issues Encourages other sustainable practices such as using reusable or recyclable supplementary materials 	<ul style="list-style-type: none"> Less food waste reduces costs for producers, consumers, caterers and intermediaries Reducing food waste can lead to more efficient overall business management procedures (e.g. stocktaking, ordering, storage) 	<ul style="list-style-type: none"> Staff trained in waste minimization Separate composting for organic material Donating edible unused food Using cooking techniques that minimize quantities of oils and fats used Other waste reduction initiatives

	between staff, management and consumers			
9. Origin of food (20 points)	<ul style="list-style-type: none"> Sourcing food locally/in the region increases food security and resilience to external shocks in food system Links producers and consumers Facilitates education Protects local food cultures 	<ul style="list-style-type: none"> Reduces long-distance food transport impacts Reduction in energy used for storage Protection of biodiversity Reduced risk of contamination and disease 	<ul style="list-style-type: none"> Contributes to local and rural economy Can improve efficiency of delivery systems Generates employment in rural areas Can reduce procurement costs 	<ul style="list-style-type: none"> ✓ Provenance of five key foods to local, regional, national or international origin ✓ Number of intermediaries between producer and consumer
10. Consumer engagement (10 points)	<ul style="list-style-type: none"> Improved health and nutrition Increased awareness Producer-consumer relationships built on trust and reciprocity 	<ul style="list-style-type: none"> Promotes sustainable food activities Educates consumers about environmental benefits and costs of certain food items 	<ul style="list-style-type: none"> Promotes food provenance and locally produced goods Consumer input can reduce costs 	<ul style="list-style-type: none"> ✓ Nutrition information on menus ✓ Health/sustainability promotion activities ✓ Customer surveys ✓ Menu information re food provenance ✓ Good choice of allergen-free dishes and options
11. Engaging with smaller producers and local communities (10 points)	<ul style="list-style-type: none"> Provides educational opportunities for local community Fosters relationships between local producers and consumers 	<ul style="list-style-type: none"> Educates workers about environmental impacts of food choice Promotes environmentally sustainable food 	<ul style="list-style-type: none"> Increased business opportunities for small producers Contributes to resilient local economy Keeps money in the local community for longer 	<ul style="list-style-type: none"> ✓ Hosting information events (re tendering) for small and local producers ✓ Incorporating specifications into contracts that increase opportunities for smaller and local producers ✓ Activities to promote local food ✓ Staff training in product information (origin, environmental and social quality of products)

3.1.2. *Seasonal (5 points):*

Despite technological advances in food transport and storage, seasonality remains an important consideration in food sustainability. Providing seasonal food means that local producers can potentially supply organizations all year round. Eating with the seasons can educate people about food and support traditional food, techniques and culture in a resilient food system. It also reduces the need to extend the shelf-life of food through the application of chemical treatments while reducing the energy needed for storage and the use of artificially heated greenhouses. Seasonally adjusted menus can potentially reduce the price of food due to better availability and fewer transport, storage and packaging costs, though this is often not adequately recognized.

3.1.3. *Fairly traded produce (5 points):*

In a globalized food system, many consumers are detached from the impacts of their consumption choices. Increased distances between producers and consumers have helped to conceal a host of diverse but related social and ethical concerns such as poor working conditions, child labour and other labour abuses. The concept of fair trade emerged in response to these concerns, seeking to address inequalities and ethical considerations in the global food system. Purchasing fairly traded produce guarantees a minimum price for farmers in developing countries, generates a social premium used to support community and environmental projects and ensures producers can secure long-term secure contracts for supplying products (Berlan and Dolan, 2014). Tea, coffee and bananas represent three of the most important commodities in international food trade, they are widely available with fair trade labels, and frequently consumed in organizational settings (Tikkanen and Varkoi, 2011).

3.1.4. *Meat (15 points):*

The production of meat, in particular red meat, has a greater environmental impact than other foods (McMichael et al., 2007). Reducing the availability of meat dishes in food outlets and providing consumers with meat-free alternatives benefit human health and the environment (Hallström et al., 2014). With demand for meat and meat products on the rise worldwide, curtailing meat consumption, in particular for the biggest consumers, is seen by many as essential to a food system that operates within planetary boundaries (Chemnitz et al., 2014).

3.1.5. *Fish (5 points)*

The increased industrialization of fishing and advances in fishing technologies have enabled large vessels to locate and catch enormous quantities of fish. Coupled with an increased demand for fish, overfishing has left many of the world's fish stocks in danger of collapse (Olson et al., 2014). Unsustainable fishing practices result in loss of biodiversity, destruction of marine habitats and damage to sensitive ecosystems such as coral reefs. These problems are being further exacerbated by the effects of climate change. In addition to environmental problems,

overfishing also raises social and economic concerns as millions of people, especially coastal communities, rely on fishing for food and for their livelihood.

3.1.6. *Eggs (5 points):*

Eggs are a cheap, nutritious and versatile food. They are a popular ingredient in breakfast, lunch and dinner dishes. Certification by a recognized food standards agency requires that producers comply with minimum health and safety and animal welfare standards. Traceability allows consumers to identify specific farms where eggs were produced while stock control and coding systems enable consumers to identify production methods such as organic or free-range. The use of organic or free-range eggs in food outlets indicates a preference for greater quality and sustainability.

3.1.7. *Water (5 points):*

Agriculture uses more water than any other human activity, however the exact usage of fresh water is difficult to quantify (Lundqvist et al., 2008). Due to the complexities in measuring embedded or 'virtual' water consumption, this section of the FOODSCALE tool focuses on two indicators of actual water use, namely source of water for consumers and the origin of bottled water. In addition to economic costs for consumers, bottled water has significant environmental costs in production, transport and disposal of plastic bottles. Providing only bottled water discourages consumers to drink more water, a practice that is beneficial for health and well-being. Supplying chilled filtered tap water for consumers removes this disincentive and encourages greater consumption of water. Tap water is often regulated to high health and safety standards, making it safe to drink. Where bottled water is procured, sourcing from local producers reduces transport distances and contributes to the local economy. Moreover, water use can be reduced by changing diets to less water intensive foods or by reducing food waste, two factors captured elsewhere in the FOODSCALE.

3.1.8. *Food Waste (10 points):*

Food waste occurs at all stages of the food chain from production to consumption, with up to half of all food lost at some stage (Parfitt et al., 2010). In higher-income countries where eating out is most common, the greatest waste is incurred by the food services industry and the consumer (Foresight, 2011). Reducing food waste has multiple benefits for society, the economy and the environment (Papargyropoulou et al., 2014). Organizations can achieve a reduction in food waste by training staff in waste minimization and food management efforts such as efficient ordering, storage and usage practices. Surplus food can be redistributed via food banks or other charitable schemes while food deemed to be no longer fit for human consumption can be used as animal feed or converted to energy. Other initiatives that organizations can introduce to encourage waste reduction include providing consumers with

free pre-purchase samples, offering smaller portions at a lower cost and providing condiments in reusable jars.

3.1.9. *Origin of food (20 points):*

Identifying food origins can reveal the complexity of food supply chains as well as the relationships involved in getting foods from 'farm to fork' (Kneafsey et al., 2013; Feagan, 2007; DeLind, 2011). This section of the assessment tool determines where the ingredients for a typical lunchtime dish come from. Much of the food we eat today is imported from around the world. Some foods, such as cacao, coffee, tea, citrus and exotic fruits, cannot be grown in certain regions and need to be sourced from abroad. Other foods are imported because of seasonality, availability, cost, convenience or for trading reasons (SafeFood, 2009). For this study, potatoes, carrots, onions, tomatoes and beef were traced to their origin as in Ireland they represent 5 key ingredients in cottage pie, a popular dish that is widely consumed both at home and in public. Were this tool to be used in other regions, these 5 ingredients could easily be replaced with foods that are important to that particular area. In Greece for example the dish could be represented as a Greek Salad (olives, feta, tomatoes, onion, cucumber).

3.1.10. *Consumer engagement (10 points):*

Food outlets can act as powerful intermediaries that provide information to help consumers make more sustainable and healthy food choices while consumer feedback can educate organizations on consumer preferences, concerns and awareness of sustainability issues (Kneafsey et al., 2013; Jørgensen et al., 2010). Providing nutrition information on menus, for example through calorie counting or a traffic light system, facilitates consumers to make healthier food choices. Organizations can hold food sustainability promotion activities such as meat-free days or sustainable food events (Vinnari and Vinnari, 2013). They are in a position to detect consumer trends that can subsequently be acted upon, for example a preference for more local produce. Other initiatives, such as providing information regarding food provenance, reinforce the organization's position as a key intermediary between producers and consumers (Renting et al., 2003). This said, information alone has been shown to have limited effects on consumer choices (Davies et al., 2014; Vittersø and Tangeland, 2015).

3.1.11. *Engaging with small producers and the local community (10 points):*

Food outlets provide thousands of meals every day for a wide range of consumers. Their food procurement activities significantly influence the food system, with millions being spent each year (Baldwin et al., 2011). Organizations are in a position to support local and smaller producers, however to do this they need to be willing to overcome potential barriers both within their own organization and outside, including organizational inertia and national and EU regulations regarding food procurement (Morgan and Morley, 2014). Willing organizations can engage with local providers through cooperation and communication, such as information

events alerting smaller producers about potential contracts (Walker and Preuss, 2008; Fairchild and Collins, 2011). They may also tailor contracts to increase opportunities for smaller producers whilst adhering to regulation (Mikkola, 2009). Staff training in product information – for example on provenance, environmental and social quality of the products – can create a long-term commitment towards food sustainability within organizations.

4. Developing and Testing the FOODSCALE method

The FOODSCALE method was developed as part of a larger multi-method research project carried out by the first author which combined qualitative and quantitative techniques, including semi-structured interviews and supply chain investigations. Its function was to facilitate the collection of primary data from organizations using a questionnaire. Data gathered relied on reports from those in charge of food procurement at each organization but were complemented with observations, interviews with food suppliers, and documentation such as menus and tender documents where available. The initial phase of data collection captured information for 8 different cases across 5 organizations located in an urban area in the Republic of Ireland.

Does the FOODSCALE method measure what it is supposed to measure? And could the results of this study be replicated? While the comparative case study approach used was never intended to facilitate conventional quantitative validity and reliability testing (as well as being based on ontological and epistemological views that caution against the application of conventional validity and reliability criteria to qualitative and mixed-method research), it is nevertheless possible to qualitatively check if the tool is valid and reliable. Regarding validity, food sustainability experts were consulted throughout the entire questionnaire design process. An early version of the tool was presented at the European Union funded TRADEIT Entrepreneurial Summer Academy 2014 in Tralee, Ireland, to an expert panel consisting of academics, consultants and business managers working in the food industry. Applying the FOODSCALE tool to a food business in the study region that is well known locally and nationally for its food sustainability credentials generated a high benchmark score (78 points out of 100) for subsequent comparisons across all 8 cases (listed as Benchmark in Tables 2 and 3).

Regarding possible replicability of the FOODSCALE results in this paper, it seems plausible to argue that its transparent and user-friendly nature could easily facilitate its application in other contexts and/or by other researchers. Modifications made during the pilot phase included minor changes to the breakdown of scores and redistribution of points across sections, which further enhanced its user-friendliness. During the pilot testing in two locations, as in all subsequent applications of the FOODSCALE method, participating food outlets were not made aware of the scoring procedure and did not know that a points allocation method was in place. This was intended to improve reliability and reduce bias in data collection.

5. Comparing FOODSCALE Scores Across Cases: Evidence from Ireland

As mentioned previously, the initial phase of FOODSCALE data collection yielded results for 8 different cases across 5 organizations, with one of them acting as a benchmark. Table 2 provides an overview of some key characteristics of all cases. It is important to note that 4 of the 8 cases were located within the same public sector organization; however, they differed considerably with regard to size of the facility, consumer base, number of transactions/meals served per day, price and quality of meals and food procurement practices. It was thus decided to treat them as individual cases for the purpose of this paper.

Table 2: Description of cases

	Primary function	Public/private sector	Number of meals served/ transactions per day	Food procurement practices	Food Subsidized
Case 1	Education	Public	650 meals	Non-centralized	No
Case 2	Education	Public	1500-2000 meals	Non-centralized	No
Case 3	Education	Public	n/a	Semi-centralized	No
Case 4	Education	Public	4500 food transactions	Centralized	No
Case 5	Education	Public	5000 food transactions	Non-centralized	No
Case 6	Industry	Private	350 meals	Centralized	Yes
Case 7	Industry Food	Private	1500 meals	Centralized	Yes
Benchmark	business	Private	n/a	Non-centralized	No

Results show significant differences in the sustainability of food provided by participating organizations. Between-case comparisons reveal the potential impact of both organizational characteristics and prevailing attitudes towards food on food sustainability performance. Contrasting two cases in particular – those with the highest (61) and the lowest (41) scores respectively – reveals how different yet comparable organizational settings can produce significantly different food sustainability outcomes. Cases 4 and 5 have similar characteristics such as function (third level education), the number of meals served per day, demographic and socio-economic composition of their consumer base, organizational structures, and location in close proximity to alternative eating options such as shops, restaurants and cafes. In contrast, the remaining 5 cases under study (excluding the benchmark case) that achieved FOODSCALE scores ranging from 44 to 59 differ in all or some of these characteristics. The results from Cases 4 and 5 point towards the crucial role of key decision makers both within and outside these organizations – catering and services managers, finance officers, central procurement officers –, whose food procurement decisions impact on the food choices of thousands of customers every day. Qualitative interview data collected as part of the wider project show

significant differences in attitudes towards food provisioning among key decision makers, a fact that is also reflected in the FOODSCALE scores for these two cases. While a detailed discussion of this point is beyond the scope of this paper, a case is made here for future research in this area.

FINAL DRAFT

Table 3: FOODSCALE scores for each case

	Total Score	Organic	Seasonal	Fairly traded	Meat	Fish	Eggs	Water	Waste	Origin of food	Consumer engagement	Community engagement
Max Score	100											
Case 1	44											
Case 2	50											
Case 3	59											
Case 4	41											
Case 5	61											
Case 6	48											
Case 7	48											
Benchmark	78											

FINAL DRAFT

Regarding variations across all 11 categories, it is possible to detect some interesting patterns. Regarding organic food, only 1 of the 7 regular cases managed to obtain any points, with the remaining 6 scoring zero. In contrast, the benchmark case achieved 6 out of 10. Seasonality and fairly traded produce showed much greater variations, with ranges of 0-5 and 0-4 respectively. One regular case achieved the maximum score of 5 for seasonality, compared to 4 for the benchmark case. Regarding fairly traded produce, only the benchmark case was given the maximum of 5 points. Regarding meat, the range across all 7 regular cases was considerable, with 4 being the lowest and 11 the highest score (out of 15). The benchmark case achieved 9 points. Scores for fish were split into two groups, with 3 regular cases scoring 0 points and 4 cases achieving 5 points. The benchmark case was given the maximum score of 5. The category eggs includes scores between 2 and 4 for regular cases, with the benchmark also scoring 4 (out of 5). Water scores were very high across all cases, with 4 of the regular cases and the benchmark case achieving the maximum score of 5. Scores for waste ranged from 6 to 8 (out of 10). Two regular cases as well as the benchmark case achieved a score of 8. Scores for origin of food displayed a narrow range of 8-10 (out of 20) across the 7 regular cases, with the benchmark case achieving 16. Similarly, consumer engagement scores ranged from 6 to 8 (out of 10), with two regular cases and the benchmark case scoring 6 and the remaining 5 regular cases achieving 8 points. The last category – engagement with small producers and local communities – was characterized by a wide range of scores (0-6 for regular cases). Here the benchmark case achieved the maximum score of 10 points.

Overall, significant variations occurred both within and between organizations regarding their overall score as well as their sub-scores profile across the 11 categories. This suggests that the success of food sustainability measures is likely to depend upon a range of factors that impact on different aspects of the food system and that are more or less influenced by organizational factors such as prevailing attitudes towards food among key decision makers and cost considerations.

6. Discussion

Organizations, through their activities in food procurement and provision, have an important role to play in promoting sustainable food. This is clearly reflected in the amount of food – more than 4500 meals & 9500 food transactions per day – provided by the 5 large-scale public and private organizations included in this research. However, in recognizing these opportunities it is important to acknowledge that institutional consumers are in a different position from individual consumers. Catering operations are influenced by a plethora of policies at all levels, and they must conduct their activities within the confines of health and safety, hygiene, procurement, waste management and other regulations. Furthermore, catering professionals are restricted by their organization and must work within the boundaries of the wider institutional structure (Mikkola, 2009). Here, organizational culture and strategy in relation to food provisioning is central. A significant factor highlighted by catering managers in the above cases is the levels of rent, rates and tariffs imposed by organizations on contract caterers. In many cases, these fixed

costs ensure that caterers are under consistent economic pressure, exacerbated by additional factors such as rising food prices and the unwillingness of consumers to pay a premium for more sustainable food. In Case 1 for example, the catering manager recalled dropping local suppliers in favor of cheaper imported produce in order to meet overdue rental payments. On the other hand, Case 5 was unique insofar as they were not under pressure to generate profit from their catering operations, thus allowing them to spend more on better quality food whilst keeping consumer prices low.

Although public sector organizations are substantially restricted by national and international procurement regulation from favoring suppliers based on their proximity, efforts at supporting local producers through creative procurement practices have shown to be successful (Morgan and Morley, 2014). In the UK, Walker and Preuss (2008) demonstrated the success of collaborative efforts involving local government, contract caterers, schools, local producers and distributors in providing a sustainable food supply for school meals. They also identified a number of supports given to small businesses to assist them in securing public procurement contracts. Further examples of public procurement initiatives to benefit local producers and promote sustainable food were found in Finland, where the procurement of local and organic food was encouraged through political recommendation. In this case, public procurement officers incorporated sustainability criteria into contracts before putting them out to tender and interpreted tender documents so as to favor local producers (Mikkola, 2009). However, as in the case presented by Walker and Preuss (2008), efforts at promoting sustainable food appear to be somewhat disjointed and dependent on the innovation and drive of interested individuals or small groups rather than as a result of any broader governmental initiative. Similar observations were made in the FOODSCALE research, in particular in Case 5 and the benchmark case, where good sustainability practice was driven by a small number of dedicated actors. Nonetheless, these cases highlight the potential to provide a sustainable food supply for public and private sector organizations through collaboration using flexible and innovative approaches to sustainability.

7. Conclusions

This paper contributes to current food sustainability debates by focusing on food bought, prepared and consumed in organizations such as schools, universities, hospitals and businesses that are not primarily tasked with the provision of food but that offer meals for their workers, service users and visitors. It thus seeks to shift attention away from food practices within the household and towards everyday public food consumption, an under-researched aspect of food systems. The FOODSCALE method presented here offers an innovative and holistic method for assessing the sustainability of food provided by organizations. Moreover, it opens up opportunities for identifying both existing good practice and areas for improvement while also pointing towards specific measures for improving the food sustainability performance of organizations.

While acknowledging the inherent complexities in comprehensive sustainability assessment, the grouping of 36 indicators into 11 categories captures the main aspects of food sustainability, as described in the international literature. The FOODSCALE method thus moves beyond many existing assessment tools that define food sustainability more narrowly. Importantly, it is easy to use and adaptable to changing external environments and different local contexts, thereby opening up possibilities for future international comparative research as well as application of revised versions of the tool. For example, concepts of sustainable food are changing all the time, with new evidence continually emerging on how to improve sustainability in farming. Scores can be easily redistributed or indicators added to reflect these changes. Interpretations for local and regional food can also be adjusted to be representative of a specific geographical area, as can the ingredients traced in the food origin section. A recent translation of the FOODSCALE tool into German involved some minor adjustments to some of the indicators, with a view to capturing national specificities in food certification and use. The versatility of the FOODSCALE method also makes it very suitable for application in different organizational contexts ranging from large organizations to small and medium-sized enterprises. Although the FOODSCALE method was initially designed to measure the sustainability of food provided as a secondary activity by organizations, primary food sector businesses such as restaurants and take-away outlets could also benefit from its application.

Overall, this research makes a major contribution to the conceptual definition, operationalization and empirical investigation of the sustainability impacts of food provision in large-scale organizations on both consumers and the entire food system. The findings clearly point towards the centrality of food procurement decisions made by individuals in key positions within the organizational food provision system, with variations in FOODSCALE scores occurring both between cases within the same organization but also between different organizations. The use of a good practice example as a benchmark case shows the potential for businesses to improve their sustainability performance in areas directly related to food (e.g. source of meat and fish used) as well as in relation to their interactions with other actors within the food system, most notably local producers but also consumers. Building on the results of the FOODSCALE study presented herein, it will be possible to conduct further research that identifies potential leverage points in existing 'systems of provision' of food intended for public consumption. Current efforts by the authors to collect FOODSCALE data in large public and private organizations across different countries (e.g. Germany, Austria) are intended to facilitate future cross-case and cross-country comparisons, with a view to capturing wider trends concerning the sustainability potential of organizations with regards to food provided for public consumption.

Note:

We would encourage the use of the FOODSCALE method by academics, students and others. The original documents for data collection and scoring are available by contacting the first author at FOODSCALEmethod@gmail.com. Materials are available in English and German.

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FINAL DRAFT

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FINAL DRAFT