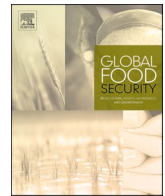


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Comparing different food banks: A case study application of a proposed standard

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ABSTRACT

Food banks are increasingly recognised as essential actors in reducing food waste and addressing food insecurity by redistributing surplus food outside formal retail systems. Their appraisal is critical for enabling mutual learning, strengthening international collaboration, benchmarking performance, and enhancing donor credibility. This paper introduces a novel methodology for cross-country comparison of food banks, grounded in the Realist Evaluation's Context–Mechanism–Outcome perspective and structured through a value chain lens to organise and identify indicators. The framework comprises 101 dimensions, representing the most comprehensive comparative assessment of food redistribution organisations to date.

The methodology is applied in a case study comparing FoodForward South Africa (FFSA) and Team Austria Tafel (TAT). The application demonstrates both the usability of the framework and the relevance of the identified dimensions for comparative analysis. Findings highlight substantial differences between the South African and Austrian food banks across nearly all dimensions, including scale, operational models, organisational structures, infrastructure, finances, and regulatory contexts. These contrasts underscore the diverse environments in which food banks function.

In South Africa's dispersed, high-need context, FFSA's hybrid warehousing and outbound delivery model achieves a broad daily reach. Conversely, in Austria's dense context, TAT's collection-based model operates effectively but at a smaller scale. Despite these differences, both food banks play indispensable roles in reducing waste and supporting vulnerable populations. The study underscores the importance of contextualising evaluation frameworks and offers a transferable tool for systematically comparing food banks across diverse socio-economic settings.

1. Introduction

The global food system is significantly underserving the needs of the worldwide population, as is evidenced by the following: between 871 and 928 million people are severely food insecure (FAO, 2024a; United Nations Statistics Division, 2024); one in three people suffers from some form of malnutrition, such as obesity, stunting, or wasting (IPU and FAO, 2021); and more than one in four people do not know where their next meal will come from (United Nations General Assembly, 2024). Further, 60 % of countries recently experienced significant food price increases due to supply chain disruptions (United Nations General

Assembly, 2024).

The United Nations Sustainable Development Goals (SDGs) include improvements to the food system (United Nations, 2023). Among the seventeen goals, SDG 2 (zero hunger) and SDG 12 (responsible consumption and production) stand out as fundamental pillars (IPU and FAO, 2021) since they aim to end world hunger and reduce food loss and waste (FLW) (United Nations, 2023). However, only 17 % of the 135 targets to achieve the SDGs are showing some form of progress (United Nations General Assembly, 2024). SDG 2, in particular, has shown the most regression or stagnation, since 123 million more people are suffering from hunger in 2022 compared to 2019 (United Nations

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General Assembly, 2024).

Despite a proportional increase in the amount of food produced (FAO, 2024b), technological progress and advances in food processing and manufacturing (Fadji and Pathare, 2023), better logistics and cold chain management (Du Plessis et al., 2022), world-class marketing, and the establishment of an inter-connected global food system, the paradox of widespread food insecurity and staggering levels of food waste and loss persists (United Nations, 2023; United Nations Environment Programme, 2024).

Approximately one-third of all food produced for human consumption (i.e., 1.3 billion tons) is lost or wasted globally (FAO, 2011). This loss¹ and wastage² occur at various supply chain stages, such as agricultural production, post-harvest handling, processing, distribution, retail, or the household stage.

The consequences of food waste and losses exacerbate the environmental footprint of the current food system (Lipinski et al., 2013; United Nations Environment Programme, 2024) through the depletion of natural resources such as water and land, decreases biodiversity, increases greenhouse gas (GHG) emissions, and contributes to the increasing problem of landfill space (Warlina and Listyarini, 2022).

Reducing food insecurity, malnutrition, and FLW is a complex challenge that requires a multifaceted approach, involving promoting sustainable production and consumption practices, reducing waste at the source, and innovation to redistribute surplus food to those in need.

In this context, *food banks* have emerged as a vital link in alleviating food insecurity (Middleton et al., 2018). Their mandate is to rescue food from various sources, such as producers, processors, retailers, and consumers, and to redistribute food to organisations or beneficiaries in need (González-Torre and Coque, 2016; Middleton et al., 2018; Oldroyd et al., 2022). These charitable food banks ultimately alleviate immediate hunger and reduce malnutrition and FLW. Food banks exist to help vulnerable people get back on their feet – not to be a long-term feeding scheme which could create dependence.

It is challenging to compare and evaluate the performance of food banks operating in different countries – primarily due to country-specific needs and contexts. However, the appraisal of food banks is vital since it i) allows food banks to learn from each other, ii) can improve the liaison and nexus between food banks in different countries, iii) allows for benchmarking to establish relative performance, and iv) gives potential donors insight into the credibility of a food bank.

We adopt a Realist Evaluation perspective, which recognises that context shapes how interventions are implemented and determines their effectiveness and outcomes (Tilley, 2000; Tilley and Pawson, 2000; Pawson, 2013). We then integrate this perspective with a value chain lens to develop a framework for the holistic comparison of food banks across countries. This framework is applied to a comparative analysis of food banks in South Africa and Austria.

We next discuss literature related to how food banks are evaluated in Section 2; the methodology is described in Section 3. Section 4 outlines the proposed indicator framework, and Section 5 discusses the results of the application of the framework to a case study of a South African (FoodForward South Africa) and an Austrian food bank (Team Österreich Tafel, or in English, Team Austria Table (TAT), which the Austrian Red Cross operates. Section 6 concludes.

2. Literature review

This section explores the current roles, challenges, and existing research on food banks, examining their functions within the broader contexts of food insecurity, food waste, and social inequality.

¹ Food loss is the decrease in the quantity or quality during production, post-harvest activities food processing, and distribution.

² Food waste is the decrease in the quantity or quality of food during the retail and consumer phases.

Specifically, food banks are considered from the perspective of their role as actors in the value chain (network) of food provision, with attention to the contextual factors that influence their success.

2.1. The evolution of food banks

The world's first food bank was established in 1967 by John van Hengel in the United States when St. Mary's Food Bank in Arizona developed a "deposit" and "withdrawal" system for excess food in the region (St Mary's Food Bank, 2024). Initially designed as a short-term solution to address hunger, food banks have since evolved into integral, long-term mechanisms to address food insecurity and reduce FLW worldwide (Reynolds et al., 2015; Okeke-Ogbuafor and Gray, 2020; Rizvi et al., 2021). Some authors, such as Middleton et al. (2018), argue that food banks contribute to food insecurity by creating a dependent population. They further argue that food banks cause the government to "look the other way" or to fail to develop strategies or appropriate legislation, since these food banks are solving a societal problem. Bazerghi et al., 2016 echo this sentiment by concluding that food banks are increasingly relied upon by those facing long-term deprivation, with many recipients using them as often as possible. It is argued that, in this case, food banks do not reduce food insecurity.

While these critiques raise important concerns, we contend that they do not fully capture the diverse realities of food banking across contexts. In many settings, food banks play a critical role in supporting vulnerable populations who would otherwise lack access to sufficient or nutritious food. Whether food banks reduce or perpetuate food insecurity may depend on how they are embedded within broader social systems, the extent of government support, and the characteristics of the populations that they serve. Thus, rather than viewing food banks as "problematic" in principle, it is more useful to understand them as context-dependent mechanisms whose effectiveness varies by geography, governance, and community needs.

Today, food banks operate as logistical, nonprofit organisations that coordinate and redistribute safe and nutritious food to vulnerable people (Rautenbach and Grobbelaar, 2024). A study by Oldroyd et al. (2022) indicated that, while food banks help increase dietary intake and reduce food insecurity, the nutritional value of the food provided is often poor (Oldroyd et al., 2022). Bazerghi et al. (2016) and Loopstra and Lambie-Mumford (2023) draw a similar conclusion that food banks play an essential role in alleviating hunger, but may face limitations due to a lack of nutrient-dense food, which limits their overall success. Consequently, food banks alone are insufficient to address broader diet-related inequalities and food insecurity.

Nevertheless, food banks can operate under one of two models: a physical system that uses warehouses to receive and distribute food, or a virtual system that uses a digital platform to coordinate food redistribution between donors and recipients. Irrespective of the operational model, food banks can either serve other nonprofits, such as soup kitchens and feeding schemes, or individual beneficiaries directly (Oldroyd et al., 2022). This dual purpose highlights food banks' essential humanitarian role in mitigating food insecurity, preventing FLW, and averting adverse health outcomes associated with food scarcity (Rautenbach and Grobbelaar, 2024).

Food banks' significance is evident worldwide (GFN, 2024). As global challenges such as rising living costs, climate change, trade wars, conflict, and other supply chain disruptions increase food insecurity, food banks have seen a marked rise in demand, confirming their role as crucial actors in modern social support systems (Bacon and Baker, 2017; Loopstra et al., 2019; Akkerman et al., 2023).

The Global Foodbanking Network (GFN, 2024) reports that its current network of food banks spans more than 50 countries on six continents, serving more than 40 million people in 2023. Food banks are essential even in high-income countries, where food redistribution has become a primary response to food insecurity and economic inequality (Middleton et al., 2018; Tarasuk et al., 2020). Food banks are also highly

relevant in developing countries, where limited governmental social welfare programs and economic challenges increase reliance on food assistance (González-Torre and Coque, 2016; Bacon and Baker, 2017).

Food banks have a positive financial impact. Reynolds et al. (2015) highlighted the potential of food banks in mitigating food insecurity and waste, showing that food rescue operations yield significant returns by saving \$5.71 of edible food per dollar spent on food banks.

Food banks have grown to become essential in addressing gaps due to economic circumstances, inadequate governance, and limited social support systems, increasingly supporting those “left behind” by traditional support structures (Nambiar and Thangam, 2022; Akkerman et al., 2023).

2.2. Challenges of food banks

Food banks face various structural and contextual challenges (Rivera et al., 2023) that can vary significantly between food banks – even when operating within the same country or region. Akkerman et al. (2023) argue that most of these challenges stem from the nature of food bank supply chains. Some literature, such as Gentilini (2013) implies different challenges between developed and developing countries. A common hypothesis is that food banks in developing countries often struggle with basic issues such as infrastructure, funding, and inefficient supply chains, which developed countries have successfully solved. However, the authors found no literature to confirm or deny the latter. Irrespective of where a food bank is located, some significant challenges exist (Bazerghi et al., 2016a; González-Torre and Coque, 2016; Rombach et al., 2018; Loopstra et al., 2019; Du Plessis et al., 2022; Akkerman et al., 2023). Below we unpack these challenges within a value chain lens (See Table 1).

In sum, food banks operate under multifaceted pressures that demand strategic planning, resource flexibility, and ideally more coordinated government support. A value chain lens highlights that these challenges are not isolated but interconnected: constraints at the input stage ripple through logistics and distribution, ultimately shaping outcomes. Recognising this interdependence underscores the need for research that links contextual conditions (e.g., governance, infrastructure, poverty) with operational mechanisms, enabling the design of context-appropriate support frameworks for food banks in both developed and developing settings.

Table 1
Challenges of Food Banks framed through the value chain lens.

Value Chain Stage	Key Challenges	Supporting Literature
Inputs (Supply side)	Variability in quantity, quality, and frequency of donations; lack of donor incentives; limited supportive legislation	(Bazerghi et al., 2016; Early et al., 2019)
Core Processes (Transformation & Logistics)	Perishable nature of food; food safety concerns; inadequate infrastructure (storage, cold chain, vehicles); reliance on volunteers for key tasks	(Rombach et al., 2018; Bazerghi et al. 2016)
Distribution (Outputs)	Difficulty in meeting demand with sufficient and nutritious food; stigma around food bank usage; monitoring and eligibility challenges	(González-Torre and Coque, 2016; Bazerghi et al., 2016)
Enabling Environment (Cross-cutting)	Financial constraints; weak IT systems; lack of government support and policy frameworks; environmental pressures (e.g., reducing carbon footprint); emotional challenges of volunteering	(Rombach et al., 2018; Bazerghi et al., 2016)

2.3. Studies evaluating food banks

The literature on food banks is diverse, covering various perspectives. For example, psychosocial aspects are addressed by Rombach et al. (2018), Middleton et al. (2018), and Rizvi et al. (2021), while usage governance (Warshawsky, 2016), and distribution systems (Prendergast, 2017) have also been studied. Bacon and Baker (2017) evaluated the geographic distribution of food banks, and Rivera et al. (2023) studied the optimisation of operations. The Global Foodbanking Network's FRAME methodology addresses environmental impacts by quantifying the avoided emissions associated with the recovery and redistribution of food (GFN, 2024b). Since this framework exclusively focuses on climate impacts, it complements the broader value chain approach followed in this work and provides a view on systemic impacts.

Only a few comparative studies of food banks, which is the focus of this research. Table 2 summarises comparative studies across countries, highlighting differences in operational structure, efficiency, user demographics, and societal roles. González-Torre and Coque (2016) and González-Torre et al. (2017) provide insights into European food banks, revealing diversity in funding, staffing, and logistical focus, with notable efficiency variations amongst food banks. Studies from Loopstra et al. (2019) and Okeke-Ogbuafor and Gray (2020) explore user demographics and dependency patterns, reflecting social and economic influences in the United Kingdom (UK), Scotland, and Nigeria. Nambiar and Thangam (2022) and Yang (2022) compare food bank systems in emerging economies such as India and China with more established systems in the UK and the U.S., highlighting disparities in data availability and institutional maturity. Together, these studies underscore the diverse challenges and adaptations of food banks within varying regions, cultures, and economic contexts. While each study covers a specific element of a range of aspects (from strategic to operational), the studies are elementary in their dimensions of comparison.

The most relevant study that the researchers could find for food bank comparisons is that of González-Torre et al. (2017). The study uses a data envelopment analysis (DEA) model to gauge how well food banks convert three inputs (food bank age, number of volunteers, number of permanent staff) to two outputs (tonnes of food distributed, and number of people served). This constrains the study to only five variables per food bank, giving limited insight. Significant work is required on benchmarking or comparing different food banks.

The summary in Table 2 confirms that comparative studies in literature are reported on a case-by-case basis, but without the benefit of guiding frameworks. With consideration of the observations from the literature review, this research aims to:

- (1) Develop a framework for a proposed standard for comparing food banks; and
- (2) Illustrate the application of the methodology in two different cases.

The purpose of such a methodology is to enable consistent and transparent comparison between food banks, irrespective of context, and to inform strategies that enhance their effectiveness within the broader value chain of food provision.

Overall, the literature highlights that food banks have become critical actors in addressing food insecurity and reducing food loss and waste, yet they operate under diverse, context-dependent constraints. Challenges span the value chain, from variable supply and logistical limitations to financial uncertainty, weak governance, and stigma. Comparative research exists but remains fragmented, often restricted to narrow sets of indicators without a unifying framework.

To address this gap, this study adopts a realist evaluation perspective (Tilley and Pawson, 2000; Pawson and Tilley, 2001; Pawson, 2013), which is particularly well suited to complex social interventions such as food banking. Realist evaluation explains results through the interaction

Table 2
Studies comparing different food banks.

Study	Geographical region (s)	Focus	Methods	Findings
González-Torre and Coque (2016)	Spain	Group or cluster Spanish food banks based on characteristics such as staffing, donations or revenue streams, supplier and beneficiary relationships, logistics, etc.	Surveys with various food banks.	Two distinct types of food banks exist in Spain: (1) Majority focus on logistics, funded by private donations, serving individuals. (2) Others focus on admin/logistics, funded by industry, serving institutions.
González-Torre et al. (2017)	96 food banks in thirteen European countries	Assess food bank operational efficiency by comparing volunteer and staff numbers, food bank age, tonnes of food delivered, and the number of individuals served.	Survey and Data Envelopment Analysis (DEA)	Wide differences across countries. Volunteers (often older) are key but need replacing. Only 16/96 banks fully efficient; average efficiency 0.766. Many banks are larger than optimal.
Loopstra et al. (2019)	United Kingdom (UK)	Evaluates the operational characteristics of different food banks to determine the correlation to the amount of food distributed.	Quantitative assessment using food bank and other data.	Limited hours reduced access. Higher use linked to in-work poverty, unemployment, and disability, but access gaps weakened disability link
Okeke-Ogbuafor and Gray (2020)	Scotland and Nigeria	Evaluates the perceptions of food bank users in two regions.	Telephonic and face-to-face interviews	Growing dependence. Food banks shifting from short-term relief to long-term support.
Nambiar and Thangam (2022)	UK and India	High-level comparison of the Indian and UK food banking system.	No methodology specified	Food banks are important in both Food banks vital in both, but India lacks robust data. Better data needed.
Yang (2022)	China and the U.S.	Explores the limitations of Chinese food banks compared to the more established American food bank system.	No methodology or data sources were specified.	U.S. food banks more advanced; China needs policy and community improvements.

Table 3
Food banking value chain stages, indicators, and supporting literature.

Value Chain Stage	Level 1: Country-Level Indicators (Context)	Level 2: Food Bank-Level Indicators (Mechanisms)
Inputs (Supply side)	Food waste availability (UNEP, 2024); poverty and inequality (World Bank Group, 2024a); Tax incentives and legislation (Akwii et al., 2021 ; Guger and Mavec, 2024)	Donation type, size, frequency; donor profiles; sourcing models (Michellini et al., 2018 ; GFN, 2020)
Core Processes (Transformation & Logistics)	Infrastructure readiness (cold chain penetration, logistics efficiency); governance effectiveness (World Bank Group, 2024c)	Storage and inventory management; transport fleet; organisational pooling of resources; warehouse infrastructure (Caplan, 2016)
Distribution (Outputs)	Urbanisation (% urban population); population density; refugee and displacement figures (UNHCR, 2024a, 2024b)	People assisted per annum/day; tonnes redistributed; geographical coverage; beneficiary eligibility and monitoring (Loopstra and Tarasuk, 2015 ; Caraher and Furey, 2018)
Outcomes (Value Created)	National hunger and nutrition indicators (FAO, 2024a ; Von Grebmer et al., 2023); food price levels; affordability of healthy diet (FAO, 2024c)	Reduction in food insecurity among beneficiaries; financial value of redistributed food; GHG emissions avoided; equity in access (GFN, 2020)
Enabling Environment (Cross-cutting)	Socio-demographics (population, poverty, inequality, unemployment); health (life expectancy, obesity, UHC index); governance (rule of law, political stability); NGO density (World Bank Group, 2024a ; 2024c ; WHO, 2024)	Organisational structure; finances; workforce composition; partnerships with NGOs, businesses, and government; membership of GFN (Akwii et al., 2021)

of Context (C), Mechanisms (M), and Outcomes (O) ([De Weger, Van Vooren, Wong, Dalkin, Marchal, Drewes & Baan, 2020](#); [Renmans et al., 2020](#)). Evaluators formulate CMO hypotheses, meaning they propose which mechanisms will be suitable in particular contexts and what outcomes will follow. In this application, country-level indicators capture the contextual conditions that shape food bank operations, while food bank-level characteristics represent the mechanisms through which

resources are mobilised and redistributed. Outcomes—such as the number of people assisted, the nutritional adequacy of parcels, or environmental benefits—emerge from this interaction. By combining realist evaluation with a value chain lens, this study develops a structured, theory-informed framework that captures both the external conditions in which food banks operate and the internal mechanisms through which they generate social and nutritional value.

3. Research method and approach

The development of a methodology for comparing food banks is based on a mixed methods approach, as outlined below. A case study approach has been adopted to develop and apply the method. Case studies are useful as “empirical evidence to convince other researchers of the applicability (or inapplicability) of a particular theory or proposition ([Myers et al., 2013](#)), and can be used for theory building or testing ([Irani et al., 1999](#)). [Yin \(2017\)](#) proposes that case studies can be used in exploratory, explanatory, or descriptive work, and that a multi-case approach allows for a richer exploration of the problem at hand.

In this research, two case studies are selected to explore the relevant dimensions when comparing food banks across countries and with each other. A literature review identifies and classifies relevant dimensions, which are then validated by expert opinion.

As clarified earlier, this study draws on a realist evaluation perspective ([Tilley and Pawson, 2000](#); [Pawson, 2013](#)), which seeks to understand how outcomes are produced through the interaction of context (C) and mechanisms (M). Country-level indicators were used to describe the wider socio-economic, health, and governance context in which food banks operate, while food bank-level indicators captured organisational mechanisms such as logistics, infrastructure, workforce, and finances. In this approach, outcomes emerge from the interplay between context and mechanisms, providing explanatory rather than merely descriptive insights.

The approach to the work is as follows:

Establish the narrative of the project: A comparative case study approach was adopted to address the research objectives outlined in Section 2. Two food banks were selected—FoodForward South Africa (FFSA) and Team Österreich Tafel (TAT)—based on a logic of contrasting contexts and researcher access. Convenience sampling was used ([Saunders et al., 2016](#)). The cases were theoretically justified: according to the [United Nations Statistics Division \(2024\)](#), Western Europe had between 2.70 and 4.40 million severely food-insecure individuals in 2022, compared to 8.1–9.0 million in Southern Africa, despite markedly different population sizes ([Worldometer](#)). This contrast between high-

and middle-income contexts provides a meaningful basis for comparison. The scope of the work was limited to food banks, excluding other food aid organisations such as soup kitchens.

Framework for comparison: The study employed a framework-guided approach to ensure that the comparison was systematic and replicable. Dimensions of comparison were identified through a synthesis of the FAO's Four Pillars of Food Security (FAO, 2024a, 2024c), the Sustainable Livelihoods Framework (Chamber of Commerce, 2024; Scoones, 1998), the World Bank's Governance Indicators (World Bank Group, 2024c), and applied food bank research (e.g., Akwii et al., 2021; Guger and Mavec, 2024; GFN, 2020). The resulting framework was structured around a value chain lens (Gereffi et al., 2005; Barrientos et al., 2011) comprising inputs (donations and surplus flows), core processes (logistics and organisational routines), distribution (reach and coverage), and outcomes (social, nutritional, and environmental value). Cross-cutting enablers such as governance, workforce, and finances were also included.

At the country level, 42 dimensions were identified across socio-

demographics, health, governance, food systems, and institutions. At the food bank level, 59 dimensions were developed to capture operational scale, logistics, infrastructure, finances, donation structures, and beneficiaries (see Fig. 1). This indicator system (see Table 4 in Section 5) provides a transparent basis for comparison and ensures that findings are not based solely on researcher interpretation but on an explicit methodological framework.

Data gathering: For the country comparison in Fig. 1, it was preferred that the data for the two countries be obtained from the same source and for the same period of analysis. For this, sources such as the World Bank Group, World Health Organisation (WHO), United Nations (UN), Food and Agriculture Organisation (FAO) of the UN, and the Statistician-General of the specific country were used. These sources are the most credible, accurate, and easily accessible. For the food bank comparison, data were more challenging to obtain, since most operational information is not available in the public domain. Accordingly, a mixed approach was adopted: direct observation of daily operations while the researchers worked as volunteers in both food banks; informal

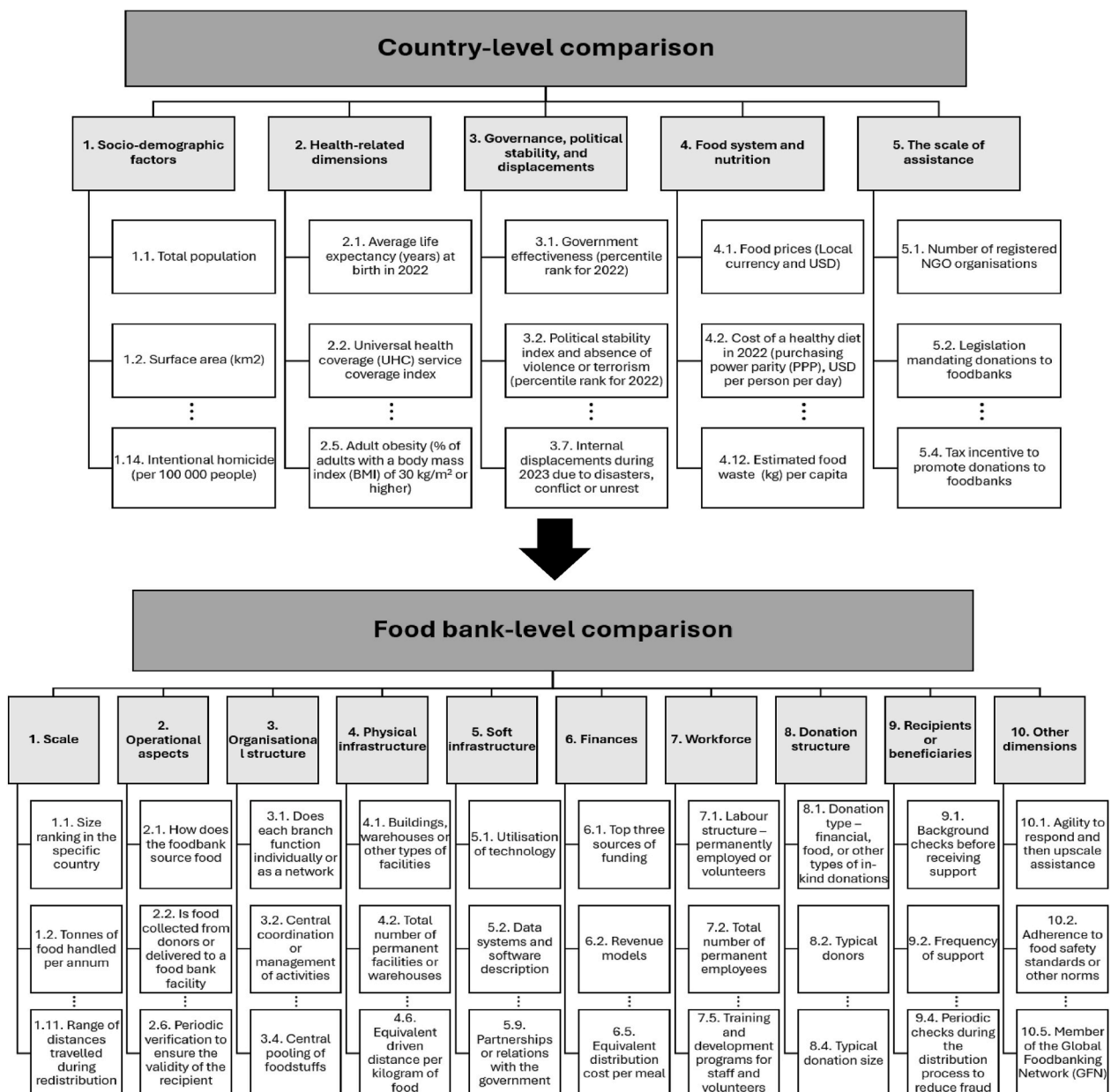


Fig. 1. Food bank comparison framework.

Table 4

Context (C): A comparative view of South Africa and Austria.

	South Africa	Source	Austria	Source
1. Socio-demographic factors				
1.1. Total population	60.41 million	World Bank Group (2024a)	9.13 million	World Bank Group (2024a)
1.2. Surface area (km ²)	1 219 090	World Bank Group (2024b)	83 879	World Bank Group (2024b)
1.3. Urban population as a percentage of total population	69 %	World Bank Group (2024a)	60 %	World Bank Group (2024a)
1.4. Percentage of urban population living in slums or temporary housing	24 %	World Bank Group (2024a)	4 %	World Bank Group (2024a)
1.5. Gross Domestic Product (GDP) in 2023 (USD)	\$377.78 billion	World Bank Group (2024a)	\$516.03 billion	World Bank Group (2024a)
1.6. Gross Domestic Product (GDP) per capita	\$6253.20	World Bank Group (2024a)	\$56 506.00	World Bank Group (2024a)
1.7. Poverty headcount ratio (% of the population living on less than \$2.15 a day)	20.50 %	World Bank Group (2024a)	0.50 %	World Bank Group (2024a)
1.8. Unemployment percentage	33.50 %	Statistics South Africa (2022)	5.10 %	Statistics Austria (2024)
1.9. Estimated number of unemployed people (people actively seeking work)	7.80 million	Statistics South Africa (2022)	0.25 million	Statistics Austria (2024)
1.10. Minimum wage per hour (local currency and USD)	The minimum national wage across all industries and provinces in South Africa is ZAR25.42 or \$1.41 per hour.	Department of Employment and Labour (2023)	No specific national minimum wages – different wages for each industrial sector and province. Example wage for unskilled wood industry workers in Styria: €13.88 or \$14.94 per hour.	Chamber of Commerce (2024)
1.11. Minimum monthly wage (local currency and USD) for 160 h work month	ZAR4 067.20 or \$219.85	Authors calculation	Example wage for unskilled wood industry workers in Styria: €2220.80 or \$2384.96	Chamber of Commerce (2024)
1.12. Average inflation rate for the past decade (2014–2023)	5.20 %	World Bank Group (2024a)	2.95 %	World Bank Group (2024a)
1.13. Income inequality (Gini Index)	63.0	World Bank Group (2024a)	30.7	World Bank Group (2024a)
1.14. Intentional homicide (per 100 000 people)	42	World Bank Group (2024a)	1	World Bank Group (2024a)
2. Health-related dimensions				
2.1. Average life expectancy (years) at birth in 2022	61 years	World Bank Group (2024a)	81 years	World Bank Group (2024a)
2.2. Universal health coverage (UHC) service coverage index	71	World Health Organization (2024)	85	World Health Organization (2024)
2.3. Leading cause of death	HIV/AIDS	World Health Organization (2024)	Coronary heart disease (CHD)	World Health Organization (2024)
2.4. Deaths per 100 000 for the leading cause of death	122.9 deaths per 100 000	World Health Organization (2024)	197 deaths per 100 000	World Health Organization (2024)
2.5. Adult obesity (% of adults with a body mass index (BMI) of 30 kg/m ² or higher)	30.80 %	World Health Organization (2024)	15.40 %	World Health Organization (2024)
3. Governance, political stability, and displacements				
3.1. Government effectiveness (percentile rank for 2022)	48.11	World Bank Group (2024c)	91.51	World Bank Group (2024c)
3.2. Political stability index and absence of violence or terrorism (percentile rank for 2022)	20	(Kaufmann et al., 2024)	69	Kaufmann et al. (2024)
3.3. Rule of law (percentile rank for 2022)	54.25	World Bank Group (2024c)	95.75	World Bank Group (2024c)
3.4. Corruption control (percentile rank for 2022)	44.81	World Bank Group (2024c)	84.91	World Bank Group (2024c)
3.5. Active conflict or displacement in the country	No	Authors	No	Authors
3.6. Number of refugees and asylum-seekers living in the country	250 250 people	UNHCR (2024a)	164 000 people	UNHCR (2024b)
3.7. Internal displacements during 2023 due to disasters, conflict or unrest	26 620 people	IDMC (2024)	674 people	IDMC (2024)
4. Food system and nutrition				
4.1. Food prices (Local currency and USD)	Loaf of white bread: ZAR11.25–22.05 (\$0.625–1.13)	Numbeo (2024)	Loaf of white bread: €1.09–1.80 (\$1.17–1.94)	Numbeo (2024)

(continued on next page)

Table 4 (continued)

	South Africa	Source	Austria	Source
4.2. Cost of a healthy diet in 2022 (purchasing power parity (PPP), USD per person per day)	Rice (1 kg): ZAR14.00–29.00 (\$0.77–1.61) \$3.70	FAO (2024c)	Rice (1 kg): €1.20–4.00 (\$1.29–4.30) \$2.80	FAO (2024c)
4.3. The recommended minimum of money required per day for a 2400 calories Western diet (Local currency and USD)	ZAR100.17 or \$5.57	Numbeo (2024)	€12.18 or \$13.10	Numbeo (2024)
4.4. Percentage of the population in 2022 unable to afford a healthy diet	61.2 %	FAO (2024c)	2.9 %	FAO (2024c)
4.5. The number of people in 2022 unable to afford a healthy diet	36.60 million	FAO (2024c)	0.30 million	FAO (2024c)
4.6. Global Hunger Index (GHI)	13 (classified as moderate GHI)	Von Grebmer, Bernstein, Wiemers, Reiner, Bachmeier, Hanano, Towey, Cheilleachair, Foley, Sheehan, Gitter, Laroque & Fritschel (2023) FAO (2024a)	Not included since the prevalence of under-nourishment and child mortality is sufficiently low.	Von Grebmer et al. (2023)
4.7. The percentage of the population experiencing severe food insecurity in the past three years (2020–2022)	8.4 %	FAO (2024a)	1.6 %	FAO (2024a)
4.8. Average number of severely food insecure people in the past three years (2020–2022)	5.0 million	FAO (2024a)	0.1 million	FAO (2024a)
4.9. The percentage of the total population experiencing moderate or severe food insecurity in the past three years (2020–2022)	19.2 %	FAO (2024a)	4.3 %	FAO (2024a)
4.10. Average number of moderate or severe food insecure people in the past three years (2020–2022)	11.4 million	FAO (2024a)	0.4 million	FAO (2024a)
4.11. Global food security index (GFSI) ranking for 2022	61.7/100	The Economist Group (2022)	78.1/100	The Economist Group (2022)
4.12. Estimated food waste (kg) per capita	Ranges significantly, 8–134 kg/capita, average of 50 kg/capita	United Nations Environment Programme (2024)	115 kg/capita (includes household, food services, and retail)	United Nations Environment Programme (2024)
5. The scale of assistance				
5.1. Number of registered NGO organisations	270 313 NGOs	Department of Social Development (2023)	124 000 NGOs	(More-Hollerweger, n. d.)
5.2. Legislation mandating donations to food banks	No legislation compelling donations to food rescue organisations such as food banks. The following, however, supports food banking: <ul style="list-style-type: none"> o Ban on organic waste in landfills in Western Cape by 2027 o Food Loss and Waste Voluntary Agreement – no other official legislation or regulation is in place at the national, provincial, or municipal levels. 	Akwii et al. (2021)	No legislation compelling donations to food rescue organisations such as food banks. Food bank organisations do not have a state mandate but work according to their initiative. Further information: <ul style="list-style-type: none"> o Food organisations such as food banks have less strict conditions than the food retail trade. For example, there is no obligation to trace goods. o However, food banks must comply with the framework conditions that apply to the food retail trade (hygiene regulations). 	Guger and Mavec (2024)
5.3. Barriers to food donations	<ul style="list-style-type: none"> o Inadequate legislation for food suitable for donation to food banks. o Date labelling of foods. o Value Added Tax (VAT) exemption for donating organisations. 	Akwii et al. (2021)	<ul style="list-style-type: none"> o Legislation challenges. o Accounting challenges. If retailers donate food, these goods must be derecognised in the balance sheet. Since only partially derecognising edible food from the balance sheet is very complex for companies, this leads to non-edible material also being donated. 	Guger and Mavec (2024)
5.4. Tax incentive to promote donations to food banks	Corporate and individual donors can claim an annual deduction for the total amount of charitable contributions made to qualifying organisations up to a	Akwii et al. (2021)	Food that is donated is subject to VAT. The food retailer must set the value of this food to zero in the balance sheet so that no VAT is incurred.	Guger and Mavec (2024)

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Table 4 (continued)

South Africa	Source	Austria	Source
limit of 10 % of their annual taxable income.			

Note: conversion rates used (1 USD = ZAR 18; 1 USD = EURO 0.93).

discussions with staff and volunteers during these placements; collection of internal documents such as reports, process guidelines, and annual accounts; and direct requests to the food banks to share their monitoring and performance data. The observations focused on core activities such as food collection, storage, sorting, packaging, and distribution, and were systematically recorded in field notes. Informal discussions helped to clarify procedures, challenges, and resource constraints, complementing what was observed in practice. The monitoring data provided by the food banks, where available, added a quantitative dimension (e.g., tonnes of food handled, numbers of beneficiaries, and distribution reach), which could then be directly mapped onto the indicator framework. This triangulation of official monitoring data, observations, and conversations strengthened the validity and reliability of the food bank-level data.

Analytical procedure: The next step was to populate the country and food bank comparison tables. For ease of comparison, the authors report the results as a table. It also allows dimensions to be clearly presented, even when all data might not be available for both food banks. Where data gaps existed, they were transparently indicated rather than omitted. No weighting or prioritisation of dimensions was applied to avoid imposing researcher bias; all indicators were treated as equally important in line with the exploratory aims of the study. Insights were derived by comparing how contextual conditions (country-level indicators) shaped or constrained organisational mechanisms (food bank-level indicators), consistent with the realist evaluation approach.

4. Proposed indicator framework: A standard for food banking comparison

This study employed a Realist Evaluation perspective (Tilley and Pawson, 2000; Pawson, 2013) to examine the functioning of food banks within their broader socio-economic and political environments. Realist evaluation is guided by three interlinked concepts: context (C), mechanisms (M), and outcomes (O). In this application, country-level indicators provide the context, food bank-level dimensions capture the mechanisms, and the interaction of the two produces outcomes related to scale, efficiency, and impact.

A value chain lens was adopted to operationalize this perspective and ensure that the most important dimensions are captured. Value chain analysis (Kaplinsky, 2000; Gereffi et al., 2005; Gereffi and Lee, 2012) views organisations as embedded in flows of inputs, processes, and outputs, shaped by enabling environments. Applying this approach to food banking highlights its role as a redistribution chain that transforms surplus food into social, nutritional, and environmental value. Unlike commercial chains focused on profit, food banks add value by reducing hunger, building community resilience, and preventing waste.

The indicator system drew on both conceptual frameworks and applied practice. FAO's Four Pillars of Food Security (FAO, 2024a, 2024c) provided benchmarks on affordability, hunger prevalence, and food insecurity, while the Sustainable Livelihoods Framework (Chamber of Commerce, 2024; Scoones, 1998) informed the inclusion of socio-demographic and economic factors such as poverty, unemployment, and inequality. The Worldwide Governance Indicators (World Bank Group, 2024c; Kaufmann et al., 2024) added institutional quality, political stability, and corruption measures, highlighting the enabling environment within which food banks operate. The Global FoodBanking Network's FRAME methodology (GFN, 2020, 2022) was also considered to ensure alignment with international practice. FRAME emphasises operational and outcome indicators such as people served, meals

provided, tonnes of food redistributed, efficiency metrics (e.g., cost per meal), and environmental impacts (food waste diverted, GHG savings). Considering the FRAME with conceptual models, the framework was designed to be theoretically robust and practically relevant to the global food banking community.

The final framework was set up to link Level 1 (country-level indicators) with Level 2 (food bank-level indicators) across the value chain. Table 3 illustrates the mapping of sample indicators to each stage, together with supporting literature.

A dual-level framework makes it possible to compare country contexts (e.g., South Africa vs. Austria) while also analysing food bank mechanisms within those contexts. By aligning realist evaluation with value chain analysis, the approach shows what food banks do and *how and why their functioning varies* across different socio-economic and governance environments. This framework is now presented in Fig. 1.

5. Results and discussion

This section addresses the research aims by illustrating and reflecting on the application of the indicator framework to two case studies. Section 5.1 discusses the **Context (C)** aspect through a country-level analysis (Table 4). Section 5.2 examines food banks' **Mechanisms (M)** in the form and shape of organisational practices. We reflect on **how contextual conditions enable/constrain mechanisms and why outcomes differ** between FFSA (South Africa) and TAT (Austria). Section 5.3 reflects on the utility of the comparative framework, as illustrated here.

5.1. Context: Country-level comparison

This section presents an evaluation of the Context (C) of our framework, that is, the broader socio-economic, political, and food system in which the two food banks operate. Table 4 compares South Africa (SA) and Austria across 42 dimensions, as shown in Fig. 1. Overall, the country comparison shows that the context of a developing country such as SA differs significantly from that of Austria, resulting in a unique landscape in which each food bank operates. The various aspects are discussed below.

5.1.1. Socio-demographic factors

South Africa's population of 60.41 million dwarfs Austria's 9.13 million, spread across a land area 14.5 times larger (1.2 m km² vs. 83 879 km²), complicating food access. Urbanisation is slightly higher in SA (69 % vs. 60 %), but 24 % of urban residents live in slums, compared to 4 % in Austria. Inequality is stark (Gini 63 vs. 30.7), reinforced by GDP per capita gaps (\$6253 vs. \$56,506) and unemployment (33.5 %/7.8m people vs. 5.1 %/0.25m). Wage disparities are equally stark: South Africa's minimum wage is \$1.41 per hour, versus Austria's \$14.94. Intentional homicide rates are also far higher (42 vs. 1 per 100 000).

Taken together, these socio-demographic conditions (C) create both higher latent demand and far greater barriers to access, requiring food banks in SA to scale wide and travel far. In Austria, smaller, wealthier, and safer populations shape an operating context where food banks address residual rather than systemic gaps (O).

5.1.2. Health-related dimensions

Health outcomes reveal significant differences. Austria's average life expectancy of 81 years surpasses South Africa's 61 years. The leading causes of death also vary, with HIV/AIDS being the predominant cause

in South Africa and coronary heart disease in Austria. Despite these challenges, South Africa's Universal Health Coverage (UHC) index is 71, above the global average of 68 and significantly higher than Africa's average of 44. This suggests that South Africa is relatively well-positioned in healthcare access compared to the rest of the continent, while still lagging behind Austria's universal health coverage index of 85.

This disparity in health-related dimensions suggests potentially more severe health impacts from malnutrition in South Africa than in Austria. This health profile is part of Context (C), which heightens the consequences of nutritional shortfalls and prioritises mechanisms to move fresh/perishable foods quickly.

5.1.3. Governance, political stability, and displacements

Austria outperforms South Africa across all governance indicators, with scores above the 90th percentile for government effectiveness, rule of law, and corruption control. South Africa lags well behind, consistent with weaker institutional frameworks common in developing contexts. Political stability also differs: Austria ranks in the 69th percentile, while South Africa ranks in the 20th percentile, underscoring higher risks of unrest. Displacement pressures further compound the gap: Sub-Saharan Africa recorded 19.5 million displacements in 2023 (69.1 % conflict-driven), versus 5.05 million in Europe/Central Asia. South Africa also hosts more refugees and asylum seekers (250 250 vs. Austria's 164 000), intensifying the strain on limited resources.

These governance and displacement conditions (C) mean that food banks in South Africa operate as substitutes for fragile state systems, bearing greater responsibility for stabilising access and support (M–O). In Austria, stronger institutions allow food banks to complement state systems, focusing on targeted relief rather than systemic coverage (M–O).

5.1.4. Food system and nutrition

Regarding food and nutrition, South Africa faces a severe affordability crisis: 61.2 % of the population (36.6 million people) cannot afford a healthy diet, compared to only 2.9 % in Austria (0.3 million people). Moderate-to-severe food insecurity affects 19.2 % of South Africans versus 4.3 % of Austrians, with South Africa having a moderate Global Hunger Index (GHI) of 13. Costs reinforce this disparity: a healthy diet costs \$3.70 in South Africa versus \$2.80 in Austria, despite some absolute food prices being lower in SA (bread \$0.62–1.13 vs. \$1.17–1.94 in Austria). Lower incomes and high poverty make food far less affordable in South Africa, where its GDP per capita is one-ninth that of Austria.

This affordability and insecurity gap (C) means that South African food banks must prioritise scale and distribution Mechanisms (M) to deliver volume and reach, making them systemic actors in food access (O). In Austria, where food insecurity is limited and tied more to marginal groups, food banks operate as complementary safety nets, redistributing surplus without bearing the primary burden of access (O).

5.1.5. The scale of assistance

Both countries face structural barriers to food donations, though for different reasons. In South Africa, unclear tax regulations and limited infrastructure weaken incentives for food rescue, while accounting rules in Austria complicate the derecognition of donated goods. In both cases, stronger policy and legislative support are needed to lower barriers and expand food bank capacity. South Africa's 270 313 registered NGOs far exceed Austria's 124 000, yet the scale of need is also far greater due to higher poverty, inequality, and food insecurity.

Here, policy and tax frameworks act as cross-cutting Context (C) conditions: in South Africa, weak incentives constrain donor mobilisation Mechanisms (M), while in Austria, compliance costs limit efficiency. In both settings, these institutional constraints shape the scale and reliability of donation inflows (O).

5.2. Mechanisms and outcomes: Foodbank-level comparison

Having established the **Context (C)**, we now illustrate how one may use the framework to compare how the two food banks deploy distinct **Mechanisms (M)** along the value chain and what **Outcomes (O)** these produce.

Table 5 holistically compares the two food banks (FFSA and TAT) by evaluating 59 key dimensions, as determined during the framework development stage (see **Fig. 1** for a summary of the dimensions). The purpose of this case comparison is to illustrate the application of the methodology that was developed at the food bank level. **Table 3** shows that both organisations operate as critical players in reducing food waste and addressing food insecurity in their respective countries. However, their scale, operations, organisational structure, infrastructure, finances, and local contexts differ significantly. Overall, the two organisations are significantly different.

Further, **Table 5** shows that the comparison is partially constrained by data limitations, particularly for TAT. While FFSA collects and reports comprehensive data across all 59 dimensions, TAT lacks data-collection practices for several dimensions, resulting in unavailable data. Nevertheless, the remainder of this section compares the two food banks.

In a dispersed, high-need **Context (C)**, FFSA's hybrid warehousing and outbound delivery **Mechanism (M)** yields a broader daily reach **Outcome (O)**, whereas TAT's collection-based model suits Austria's dense **Context (C)** but at a smaller scale **Outcome (O)**.

5.2.1. Scale

FoodForward South Africa (FFSA) operates at a much larger scale than Team Österreich Tafel (TAT), redistributing over 21 000 tonnes of food annually compared to TAT's 5500 tonnes. FFSA also supports approximately 920 000 people daily, whereas TAT assists around 60 000 individuals across the year. These figures reflect not only organisational ambition but the fundamentally different contexts in which the two food banks operate.

From a realist perspective, South Africa's context (C) of high poverty (20.5 % below the \$2.15/day threshold), widespread food insecurity (61 % unable to afford a healthy diet), and dispersed geography creates demand for large-scale warehousing and outbound delivery mechanisms (M). These mechanisms enable FFSA to achieve high beneficiary coverage (O), but at the cost of high transport intensity (over 613 000 km travelled annually).

By contrast, Austria's context (C) of lower poverty, high GDP per capita, and dense settlement patterns enables TAT to adopt just-in-time redistribution mechanisms (M), where food is collected and distributed within one or two days. This produces outcomes (O) of very low food waste (under 5 %) and lower operating overheads, but at a smaller absolute scale of reach.

Framed through the value chain, these differences highlight how the same functional stage — scale of redistribution — is shaped by contrasting input flows and logistical mechanisms. Rather than representing inefficiency, the divergence shows how food banks optimise at different points along the chain, depending on their contextual constraints and opportunities.

5.2.2. Operational aspects

FFSA operates a hybrid model, combining virtual redistribution (beneficiaries collect food directly from donors) with physical warehousing supported by inventory management and proportional allocation systems. This structure responds to South Africa's dispersed geography and high demand, but it increases reliance on logistics and coordination. TAT, by contrast, uses a just-in-time redistribution system, moving food directly from donors to beneficiaries within one or two days. This reduces storage needs and keeps waste below 5 %, but limits scale.

Viewed through a realist lens, FFSA's context of greater poverty and

Table 5
Comparison between the two food banks.

	FoodForward South Africa (FFSA)	Team Austria Table (TAT)
Scale		
Size ranking in the specific country	Largest food bank in terms of all metrics.	Largest food bank in terms of the number of distribution points.
Tonnes of food handled per annum	Virtual warehousing program: 12 960 t per annum. Physical warehousing program: approximately 8800 t. Approximately 19 505 t across both programs.	Five thousand five hundred (5500) tons of food per annum.
Tonnes of food saved from landfills per annum	Approximately 10.36 %	No data are collected, but estimates are that well over 90 % or 4950 t of food is saved from landfill.
Percentage of handled food wasted	Approximately 10.36 %	Far below 5 %, since there is no temporary storage of food, it is redistributed on a just-in-time basis (food is delivered and distributed on the same or next day).
Total number of people assisted per annum	87 million meals	Approximately 27 000 households or 60 000 individuals are served annually.
Number of people assisted per day	920 000 people	No data are available.
Tonnes of GHG emissions saved per annum	113 152 tonnes	No data are available.
Total distance driven per annum to deliver or collect food using company vehicles	3996 trips covering 613 045 km (Mar 2023–Feb 2024)	No data are available.
Food bank's spatial coverage	 <p>Note – FFSA reaches all the above locations in SA (indicated in colours)</p>	 <p>Note – TAT is not operational in Vorarlberg and Salzburg (indicated in yellow).</p>
Number of unique towns reached	536 towns (March 2021–Feb 2024)	No data are available.
Range of distances travelled during redistribution	Inter-quartile range (IQR): 15–196 km	Not applicable since there is no delivery to beneficiaries. Further, there is a food bank in almost every political district.
Operational aspects		
How does the food bank source food	The in-house food sourcing team identifies and approaches donors directly to donate; Marketing and PR lead to donors reaching out to FFSA. Donors then commit to donate food on a predetermined basis. Ad-hoc donations are also possible.	The TAT team maintains a list of frequent donors. Potential donors are contacted weekly to arrange for collection. Before a food collection, all donors are usually called and asked whether food is available for collection. Collection from supermarkets (80 %) as well as farmers and producers (18 %) and special acquisition campaigns (2 %). Collected from donors.
Is food collected from donors or delivered to a food bank facility	Collected from donors or delivered by donors directly to the warehouses.	Collected from donors.
Storage and inventory management	<u>Physical warehouse system:</u> Goods are received at the warehouse, and the data are imported into the inventory management system. Products are then relabelled and stored.	Receiving of goods at the warehouse. There is no dedicated inventory management system. The quantities are roughly captured via estimates to enable a later evaluation.
Picking and packing of food parcels	Based on the current warehouse stock levels and beneficiary demand, food is proportionally allocated based on the size of the beneficiary organisation. Items are picked accordingly by FFSA staff or volunteers, packaged, and then palletised.	Standard process: Goods are arranged on retail shelves at the food bank distribution points. Beneficiaries then walk through the facility and identify the goods they need. A TAT employee then picks the items identified. The amount handed out depends on the size of the household. At some food bank distribution points, goods are packed in packages (cartons) for individuals or families. This depends on the number of people who register for the distribution day.
Collection of food by recipients or delivery by food bank	Food is delivered to some beneficiaries. Some beneficiaries collect food from the warehouse.	Beneficiaries collect food directly from the food bank warehouse. In principle, there is no delivery, but in exceptional cases, in the event of individual problems or health restrictions, a delivery can be made. However, there is no entitlement to this service.
Periodic verification to ensure the validity of the recipient	A vetting process is in place to validate the recipient's needs to reduce fraud or misrepresentation.	Basis checking and validation of the needs of beneficiaries once a year. (Affidavit, fixed income limits per household).
Organisation structure		
Does each branch function individually or as a network	Multi-tiered network - warehouses supply to Mobile Rural Depots or delivery points and then collected by beneficiary organisations.	Each facility functions as an independent entity during status quo working. However, there is an Austria-wide service concept to ensure that the Austria-wide common framework conditions are adhered to.
Central coordination or management of activities	Yes. Strategic directives and some operational elements are driven from the head office. However, managers make the majority of operational decisions at the facility level.	Coordination at a) local level and b) coordination of the guidelines by the federal state office in the respective Red Cross regional association. At the Austrian level, the strategic aspects are handled by the Austrian Red Cross Central Office.
Central pooling of resources such as vehicles and staff	Yes. Different facilities pool vehicles and staff.	The vehicles are managed decentrally at the distribution points. The same applies to the staff, who are mostly volunteers.
Central pooling of foodstuffs	No. Food is not pooled across facilities in different provinces.	In principle, food is not pooled across facilities in different provinces. The exception is bulk goods donations, which are temporarily stored in large warehouses and can be pooled.

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Table 5 (continued)

	FoodForward South Africa (FFSA)	Team Austria Table (TAT)
Physical infrastructure		
Buildings, warehouses or other types of facilities		
Total number of permanent facilities or warehouses	Nine warehouses across South Africa	125 Warehouse/distribution points
Number of temporary or mobile rural depots	50 delivery points in the FFSA network	Usually, no mobile distribution points since collection occurs at fixed, permanent locations.
Total number of vehicles	33 vehicles actively operating in the fleet (Mar 2023–Feb 2024)	No data are available since vehicles are managed decentrally. Further, vehicles are not used exclusively by TAT but for a wide range of tasks.
Types of vehicles and description	3 x cars, 9 x 1-tonners, 3 x 1.3-tonners, 4 x 5-tonners, 9 x 8-tonners, 4 x 14-tonners, 1 x other vehicle	Typically, a Volkswagen Kombi or Mercedes Benz Transporter ambulance, which has reached the end of its service life, is used. No further data are recorded.
Equivalent driven distance per kilogram of food	A median of 0.093 km/kg or 93 m is travelled per kilogram of food redistributed.	No data are available.
Soft infrastructure		
Utilisation of technology	A digital information system is used to collect and assess data of all SC processes or actors. This is used to drive decision-making and support operations.	A digital platform is used to record beneficiary information and the service process (number of volunteers deployed, to whom, and how often volunteers are deployed).
Data systems and software description	Enterprise Resource Planning System (Business Central Product)	No uniform standard. There are different applications in use (due to federalism).
Tracking and tracing of food during distribution	No tracking or tracing of goods during distribution, meaning no real-time visibility at the shipment level.	No tracking or tracing of goods during distribution, meaning no real-time visibility at the shipment level.
Data collection and reporting to stakeholders	Incoming and outgoing food-related data are collected. These data are commonly reported to donors and/or beneficiaries.	Incoming and outgoing food-related data are collected. No specific reporting of these collected data
Communication with donors	Stewardship with donors on a quarterly basis in the form of a report. Tonnage and or Rand value, GHG emissions saved, and the number of meals are all reported to keep donors aware of their impact.	Occasionally, annual reports from the respective TAT issuing offices are handed out to the donors (e.g., in the province of Styria). Communication with the donors is carried out directly by the respective TAT commander and his team. Red Cross regional associations provide aggregated data in areas of activity.
Communication with recipients or beneficiaries	Beneficiary organisations get numerous types of communication: A monthly newsletter to convey issues, Monthly statements, such as a delivery note (invoice), are shared when collecting food. Monthly statements contain detailed data such as tonnage, cost etc. Quarterly meetings (in-person and virtual) with beneficiaries to discuss challenges and opportunities.	Austria-wide statistics are available. Information is shared with recipients through the TAT website, and notices are placed at the food bank distribution points.
Relationships with local businesses	A formal relationship is established with each donor, which details the nature of the donations, such as the type of food and the condition thereof. All food donors sign a food-donor agreement (approx 20-page document), which details the types of food to be donated and to prevent dumping of food not suitable for redistribution.	Forms a fundamental part of the social fabric of the donation culture. Very informal, yet committed to donating food. There are also framework agreements in place with supermarket centres.
Collaboration with other NGOs	Primarily focusses on assisting other NGOs such as creches, soup kitchens, Gift of the Givers, etc. However, limited collaboration with other food banking NGOs.	Directly serve individuals in need. Food that is left over after distribution is often passed on to other NGOs. Cooperation with other NGOs is always given where necessary. Limited collaboration with similar organisations.
Partnerships or relations with the government	At the municipal level, there is no formal relationship. At the provincial level in the Northern Cape Province, there is an agreement with the Department of Social Development. No other forms of agreement on a provincial level. On a national level, there is no national funding or written engagement with the South African government. However, there is good two-way verbal communication and interaction.	Various forms of partnership and collaboration through the Austrian Red Cross via working groups in the Climate Ministry. There is also an association of food banks in Austria, where some Red Cross regional associations are represented. The respective Red Cross regional associations have coordinating and representative functions in these bodies.
Finances		
Top sources of funding	Corporate donors; Trusts and other foundations; Fundraising events and campaigns; Individual donors;	Note – no structural funding at the Austrian level. However, some regional government funding. Other donations: 1. Time donations of voluntary workers; 2. Monetary donations from the organisation itself; 3. Dedicated donations; 4. Fundraising projects.
Revenue models	Cash flow is challenging for any NGO. Diversified income sources – less reliant on specific sources. Some funding is sourced from services rendered, such as “fees for services/projects” and BO membership fees.	No data are available.
Total operating cost of food bank	ZAR43 098 604 or \$2 394 366	No data are available.
Financial equivalent of saved food	ZAR968 980 911 or \$53 832 272	Estimated to be €30–50 per distribution per person. No other data is available.
Equivalent distribution cost per meal	ZAR0.47 or \$0.026	No data are available.
Workforce		

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Table 5 (continued)

	FoodForward South Africa (FFSA)	Team Austria Table (TAT)
Labour structure – permanently employed or volunteers	Both permanent employees and volunteers.	Both permanent employees and volunteers.
Total number of permanent employees	Nationally, a total of 79 permanent staff and nine contractual staff who are contract workers or interns.	Nationally, less than 20 full-time equivalents.
Total number of volunteers	Many businesses volunteer as part of staff engagement programs. Approximately 2500 volunteers are part of this. In total, approximately 10 000 people volunteer per annum across various projects in the country.	Approximately 6000 volunteers work at the institution per annum, fulfilling various roles and responsibilities.
Volunteer-hours per annum (product of the number of volunteers and hours worked)	Between 15 000–20 000 volunteer hours per annum	No data are available
Training and development programs for staff and volunteers	Training is part of the budget, and staff that require training are sent for training. Individuals who show potential are selected for special training programs. Training is an important element since this forms part of their continuous improvement and growth strategy.	Volunteers and staff are all equipped with basic skills. This includes a first aid course, “The Red Cross Induction” course, an introduction to the service processes and a hygiene course.
Donation structure		
Donation type – financial, food, or other types of in-kind donations	Food donations; Monetary donations; In-kind donations such as diesel, vehicles, IT software, packaging materials, etc.	Food donations; Monetary donations; In-kind donations by the Austrian Red Cross include facilities, fuel, vehicles, IT software, and other service such as staff. No other in-kind donations.
Typical donors	Food donations: Retailers, food producers such as processors and farms, and individuals. <u>In-kind donations:</u> Private companies such as banks, retailers, and individuals.	Food donations: Retailers, farmers, other agriculture businesses, food manufacturers, and processors. No food donations from private individuals are possible (hygiene law prohibits food donations from this group).
Typical donation frequency	A continuous flow of donations, with approximately 11 donations of varying sizes per day across all warehouses.	Weekly donations to beneficiaries.
Typical donation size	Donations vary between 242 and 4278 kg of food. Fifty percent of food donations to FFSA are larger than 1.6 tonnes.	Donation sizes vary between 50 and 200 kg.
Recipient or beneficiaries		
Background checks before receiving support	A vetting process is in place to validate the recipient's needs.	Submission of a declaration annually. Principle of trust.
Frequency of support	Each beneficiary organisation served at least one delivery a month. The single monthly delivery is justified due to the large network/distances to minimise cost. In addition, there are ad-hoc deliveries of fresh produce through the virtual food bank system.	TAT serves beneficiaries once a week. No other ad-hoc deliveries are made.
Level of assistance or unit of assistance	Similar to a Business-to-Business relationship, FFSA supports other beneficiary organisations.	Help individuals and families.
Periodic checks during the distribution process to reduce fraud	A dedicated team of FFSA perform audits during the distribution process.	Annual checks of beneficiaries to ensure eligibility. New beneficiaries complete a form confirming their income is below a specified level.
Other dimensions		
Agility to respond and then upscale assistance	Response time of between 24 and 48 h, depending on the location and ability of other third-party NGOs.	Food and other products are issued after collection on the same day or the next day.
Adherence to food safety standards or other norms	In the absence of food surplus standards, FFSA is obliged to conform to the following legislation: Consumer Protection Act (Act 68 of 2008) Foodstuffs, Disinfectants, and Cosmetics Act (Act 54 of 1972). In addition, warehouse managers conduct internal audits at each branch. Also, external audits of food donors are conducted to ensure compliance with their own standards.	There are no specific legislation or standards pertaining to food banks or the redistribution of surplus food. However, food banks and food organisations have to comply with the Food Safety and Consumer Protection Act or Nahrungsmittelsicherheits- und Verbraucherschutzgesetz (LMSVG).
Types of packaging used for food parcels	A combination of new and used carton boxes are utilised.	Old carton boxes are re-used to package parcels.
Description of products donated to beneficiaries	Fresh vegetables – 27,08 % Fresh fruit – 13,26 % General groceries – 11,67 % Bakery goods – 11,01 % Prepared meals – 9,64 % Other products – 27,36 %	No information is provided to beneficiaries in this regard.
Member of the Global Foodbanking Network (GFN)	Yes	No

Note: conversion rates used (1 USD = ZAR 18 and 1 USD = EURO 0.93).

Source: Based on data collected from FFSA and TAT.

spatial dispersion drives mechanisms that emphasise warehousing and delivery, producing outcomes of large-scale reach but higher operational costs. TAT's denser and more affluent context allows for leaner mechanisms centred on speed, with outcomes of efficiency and low food waste. From a value chain lens, FFSA strengthens the transformation and logistics stage, while TAT optimises the input–distribution interface.

5.2.3. Organisational structure

FFSA operates as a multi-tiered network, centrally coordinated but

with autonomy at facility level, supported by nine warehouses and 50 rural depots. TAT functions as independent distribution points within a national framework set by the Austrian Red Cross. Resource pooling also differs: FFSA centralises vehicles and staff across facilities, while TAT manages them locally, with only occasional pooling of bulk donations.

In realist terms, FFSA's central coordination (M) responds to South Africa's dispersed geography and high demand (C), producing outcomes (O) of broader reach and consistency. TAT's decentralised model (M) reflects Austria's Red Cross federation context (C), leading to outcomes

(O) of flexibility and strong local responsiveness.

5.2.4. Physical infrastructure

FFSA's nine large warehouses and fleet of 33 vehicles form the backbone of its operations, enabling it to handle and redistribute high food volumes across South Africa's vast geography. The scale of infrastructure reflects a deliberate strategy: investing in centralised, high-capacity facilities and transport as a way to overcome distance and dispersed demand. By contrast, TAT's 125 smaller distribution points rely less on transport fleets and more on community-level access, supported by repurposed Red Cross vehicles. This approach minimises storage needs and ensures that food moves rapidly to beneficiaries, although it provides less visibility at the national level.

Unlike other operational aspects, infrastructure highlights how food banks "embed" themselves physically in their environments: FFSA concentrates capacity to bridge distance, while TAT multiplies access points to take advantage of population density. These different infrastructural choices show how value chain design is contingent on geography, settlement patterns, and the availability of supporting institutions such as the Red Cross.

5.2.5. Soft infrastructure

The contrast between FFSA and TAT is especially visible in their use of digital and reporting systems. FFSA's ERP platform creates an integrated view of donors, beneficiaries, and redistributed food, producing donor-facing metrics such as meals, tonnage, and avoided emissions. This infrastructure is not just a technical tool but a strategic response to the pressures of operating in a resource-constrained environment, where transparency and accountability are essential for attracting corporate donors and sustaining legitimacy. TAT, by contrast, relies on varied local applications across distribution points, consistent with Austria's decentralised Red Cross framework. This approach provides sufficient functionality for day-to-day operations but offers limited aggregation of national-level data.

Through a value chain lens, these differences illustrate how information systems shape coordination and accountability. FFSA's ERP system strengthens central oversight and reporting across a dispersed chain, while TAT's lighter systems reflect a just-in-time model where physical immediacy substitutes for digital visibility. In realist terms, information infrastructure operates as a mechanism that mediates between organisational context and external stakeholders, enabling food banks to demonstrate value creation as much as to manage operations internally.

5.2.6. Finances

FFSA reports an annual budget of ZAR43 million (\$2.4 million), complemented by an estimated ZAR968 million (\$53.8 million) in redistributed food value, allowing it to calculate efficiency at ZAR0.47 (\$0.026) per meal. This mix of cash and in-kind donations provides financial visibility and donor accountability in a volatile South African context. By contrast, TAT relies largely on in-kind support from the Austrian Red Cross (vehicles, facilities, staff), with limited published data beyond estimates of €30–€50 per beneficiary annually.

In value chain terms, FFSA's diversified revenue streams sustain large-scale logistics and enable cost reporting as part of its operational efficiency. From a realist perspective, these are mechanisms (M) that stabilise operations in a resource-constrained context (C). TAT's institutional embeddedness within the Red Cross reflects a stable governance context (C), reducing pressure for transparency but limiting comparability of outcomes (O) across cases.

5.2.7. Workforce

Both food banks depend heavily on volunteers alongside a smaller permanent staff base. FFSA employs 79 staff and engages around 10 000 volunteers annually, contributing 15 000–20,000 h. TAT operates with under 20 staff but mobilises 6000 volunteers yearly. Training differs:

FFSA emphasises capacity-building for scaling operations, while TAT provides standardised courses in hygiene and service delivery.

From a realist perspective, reliance on volunteers is a shared mechanism (M), but in South Africa's dispersed and large-scale context (C) it requires structured training to ensure reliability, whereas in Austria's proximity-based context (C) it supports frequent, small-batch service delivery as the main outcome (O).

5.2.8. Donation structure

FFSA's donors include retailers, food producers, and individuals, with donation sizes ranging from 242 to 4278 kg, including full truckloads. Monetary donations are also accepted, contributing significantly to its annual redistribution of 21 760 tonnes. By contrast, TAT receives smaller contributions of 50–200 kg, mostly from retailers and farmers. Austrian hygiene laws prevent donations from individuals, and TAT does not accept monetary support.

The contrast highlights how donor structures shape food bank capacity: FFSA's broad donor mix, including individual and cash contributions, is a mechanism (M) that requires but also drives scale and flexibility in South Africa's high-need context (C). In Austria, regulatory constraints narrow donor participation, creating smaller, more stable inflows (O) but limiting the ability to scale rapidly in response to shocks.

5.2.9. Recipients

Both food banks have eligibility requirements, but the intensity of vetting differs. FFSA uses an in-house team to validate beneficiary organisations, providing monthly deliveries and additional ad-hoc fresh produce, while supporting around 920 000 people daily. TAT, by contrast, relies on the principle of trust with recipients, offering weekly distributions to about 60 000 individuals but without additional deliveries.

This contrast shows how targeting mechanisms differ by context: FFSA's formal vetting (M) manages scarce resources in a high-demand environment (C), ensuring that limited supplies reach the most vulnerable, even if this reduces accessibility. TAT's trust-based eligibility (M), in a lower-need context (C), maintains easy access and higher frequency (O), though with less scrutiny over need.

5.2.10. Other dimensions

Agility and adherence to food safety standards distinguish both food banks. FFSA's response time for providing assistance is estimated to be between 24 and 48 h, depending on location, while TAT redistributes food immediately upon collection. Both adhere to strict food safety regulations, with FFSA conducting internal and external audits and TAT complying with Austria's Food Safety and Consumer Protection Act.

5.3. Reflection

This section reflects on the utility of the comparative framework as applied in Sections 5.1 and 5.2, and revisits the motivations outlined in the Introduction: that appraisal i) allows food banks to learn from each other, ii) can improve liaison between food banks in different countries, iii) allows for benchmarking, and iv) gives donors insight into the credibility of a food bank.

Section 5.1 addresses Context (C) by comparing South Africa and Austria across 42 dimensions. This is intended to illustrate how differences in demography, health, governance, food systems, and institutions shape the role of food banks. In this case, we see how food banks act as substitutes for fragile state functions (South Africa) or as complementary safety nets (Austria). These contextual insights help food banks in similar settings identify priorities and constraints, and provide the "C" against which mechanisms and outcomes can be interpreted.

Section 5.2 then examines Mechanisms (M) and Outcomes (O) at the food bank level. The comparison of scale, operations, organisational structure, infrastructure, finances, donations, and beneficiaries illustrates how FFSA and TAT configure different mechanisms in response to

their contexts, producing patterned differences in reach, efficiency, and environmental performance. This enables context-aware benchmarking and mutual learning: organisations can ask not only “how do we compare?” but “how does our context explain our mechanisms and outcomes?”.

For donors and policymakers, the combined picture from Sections 5.1 and 5.2 provides a structured view of credibility, scale, and value creation. Through a realist CMO lens, the framework may help explore where support would have the most significant impact and where collaboration or knowledge transfer between food banks may be most promising. In this way, the reflection confirms that the framework supports learning, liaison, benchmarking, and donor appraisal, while generating C–M–O configurations that can inform future mid-range and management-oriented theorising about food banking.

6. Conclusion

6.1. Theoretical contribution and potential for mid-range theory development

This paper's main contribution to the literature is a realist-informed framework and process for comparing food banking. The framework acknowledges context (C) and its implications for operational mechanisms (M) and Outcomes (O) across food banks in different countries. To the authors' knowledge, this is the most comprehensive comparison framework of any food redistribution organisation. The application of the methodology was illustrated through a comparison of a South African food bank, FoodForward South Africa (FFSA), with an Austrian food bank, Team Austria Tafel (TAT). The case study highlights the relevance of the identified dimensions to facilitate a comparative analysis of the two food banks.

The case study application highlights significant differences between FFSA and TAT, two examples of food banks in low- and high-income countries. The comparative findings are consistent with a realist, value-chain explanation: South Africa's affordability gap, spatial dispersion, and governance features (**Context**) favour mechanisms that combine warehousing, outbound delivery, ERP-supported inventory, and diversified funding (**Mechanisms**), producing high reach, quantified GHG benefits, and higher transport intensity (**Outcomes**). Austria's dense settlement, strict hygiene/accounting regime, and Red Cross integration (**Context**) favour just-in-time, collection-based redistribution with decentralised facilities (**Mechanisms**), yielding very low storage waste and lean operating footprints (**Outcomes**). Rather than ranking performance, this CMO analysis and formulation help make sense of the choice of mechanisms in light of the context in which a food bank operates, clarifying **why** structurally different designs are rational and practical within their contexts.

The CMO logic provides a structured basis for theory development. Because CMO configurations specify how particular mechanisms operate under identifiable contextual conditions and produce observable outcomes, they offer a pathway for building mid-range theory—understood as bounded, empirically testable explanations (Merton, 1949; Pawson, 2000). In the context of food banking, recurring CMO patterns can reveal how redistribution mechanisms function as part of value chains under different economic, spatial, and institutional conditions. By comparing cases, such as FFSA and TAT, we can identify regularities. The framework enables systematic comparison across countries by specifying if–then–because propositions. For example:

- If poverty is high and populations are dispersed (C), then warehousing with outbound delivery emerges (M), because central capacity is needed to internalise distance—yielding high coverage but high km/kg (O).
- If urbanisation and retail density are high (C), then just-in-time redistribution dominates (M), because proximity substitutes for storage—yielding low waste and lower cost per meal (O).

At the same time, CMO configurations create opportunities to extend or integrate other management theories. For example, transaction cost economics (Nickerson and Yen, 2018; Rindfleisch, 2020) helps explain why certain mechanisms (such as warehousing) emerge in high coordination-cost contexts, while decentralised collection may be more efficient under low coordination costs. Resource-Based View (Lockett et al., 2009) and Knowledge-Based View (Grant and Phene, 2022) perspectives further explain how organisational capabilities and learning processes influence the feasibility and performance of different mechanisms within specific contexts. In this way, our indicator framework in conjunction with CMO analysis does not replace existing theories but provides a structured analytical platform for exploring, extending, or integrating them. Through identifying and comparing CMO patterns across countries, researchers can therefore advance both mid-range theorisation of food redistribution value chains and the refinement of broader management theories as applied to non-profit logistics contexts.

From a managerial and societal perspective, this research provides an essential step toward building a rigorous comparative framework for food banking. Such a framework matters because food banks increasingly operate as essential safety nets, yet their practices and impacts vary widely across national contexts. By enabling systematic learning across food banks in different contexts, the framework can highlight opportunities for efficiency gains, innovation, and enhanced impact. It also deepens understanding of why certain mechanisms succeed or fail in specific environments, using an if–then logic that supports the development of mid-range theories. Beyond academic value, the framework offers practical benefits: donors and policymakers can use it as an assessment tool to obtain a structured overview of operations, and to identify which elements of the food bank value chain would benefit most from support in order to maximise societal impact in their country context.

6.2. Limitations and future work

However, some limitations exist. First, only two cases were used in applying the methodology, thus limiting the generalisation of the framework and its refinement through multiple applications. Further, the comparison is partly constrained by data limitations, particularly for TAT. While FFSA collects and reports comprehensive data across all 59 dimensions, TAT lacks data collection practices for several key aspects, leaving certain dimensions unaddressed. This underscores the need for standardised data collection and reporting frameworks to enable more thorough comparisons.

Future research should therefore focus on three areas: first, applying the framework to a wider range of food banks across diverse contexts to test its robustness, refine its dimensions, and expand its explanatory power; second, investigating the practical feasibility of efficiency improvements that can be transferred across contexts, while remaining sensitive to local constraints; and third, developing standardised data collection and reporting systems that would allow donors, policymakers, and food banks themselves to monitor, assess, and strengthen their impact more effectively.

AI declaration

During the preparation of this manuscript, the author(s) used GPT-5 and Grammarly Premium to review grammar and improve clarity. The AI-assisted content was then reviewed, edited, and verified by the human author(s) to ensure accuracy and integrity.

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CRedit authorship contribution statement

Martin Johannes du Plessis: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Software, Validation, Visualization, Writing – original draft. **Euodia Vermeulen:** Data curation, Formal analysis, Validation, Writing – review & editing. **Helmut Aschbacher:** Data curation, Formal analysis, Investigation, Validation, Writing – review & editing. **Sara Grobbelaar:** Funding acquisition, Resources, Writing – review & editing. **Isabel Meyer:** Conceptualization, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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