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Integrated strategies for food waste reduction in Sierra Leone: A collaborative approach

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Abstract

Food waste is a pervasive global issue with significant economic, social, and environmental implications. In Sierra Leone, food waste is particularly acute, with substantial losses occurring at the post-harvest stage due to inadequate storage facilities, poor transportation infrastructure, and limited access to proper preservation technologies. This article examines the efficacy of collaborative approaches in mitigating food waste among farmers and non-governmental organizations (NGOs) in Sierra Leone. Through a comprehensive literature review, the study synthesizes existing research, case studies, and reports to highlight the importance of collaborative efforts in reducing food waste. The review highlights the importance of developing coordinated and cooperative strategies that involve diverse stakeholders, including government agencies, NGOs, businesses, and community groups. The findings reveal that collaborative governance (CG) processes, which engage stakeholders in consensus-oriented decision-making, are well-suited for addressing food waste in complex systems. The study also identifies key challenges and opportunities associated with collaborative approaches, emphasizing the importance of stakeholder engagement, resource availability, and contextual relevance. The article concludes with recommendations for improving the effectiveness of collaborative efforts and highlights the potential for these approaches to enhance food security and environmental sustainability in Sierra Leone. This study contributes to the broader understanding of food waste mitigation strategies and provides insights into the enablers, challenges, and best practices for collaborative approaches in the context of developing countries.

Keywords: Food waste; Food waste reduction; Food waste ln Sierra Leone; Integrated strategies for food waste Reduction

1. Introduction

Food waste represents a major global challenge with far-reaching economic, social, and environmental impacts. The Food and Agriculture Organization (FAO, 2023) estimates that about one-third of all food produced for human consumption, roughly 1.3 billion tonnes, is lost or wasted each year, resulting in global economic losses of around US $1 trillion. In developing countries such as Sierra Leone, food waste is particularly severe at the post-harvest stage due to inadequate storage, transportation, and preservation infrastructure, leading to losses of approximately US $200 million annually, or nearly 5% of the country's GDP (SLARI, 2023; WFP, 2024). As global demand for food continues to rise, with the population projected to reach 9.1 billion by 2050 and food production needing to increase by 70% to meet future needs (FAO, 2009; Tilman et al., 2011), the need to reduce food waste becomes increasingly

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urgent. Current inefficiencies leave an estimated 870 million people hungry and millions more undernourished (FAO, 2013), underscoring the link between food waste mitigation and global food security.

In response to these challenges, this study examines the effectiveness of collaborative approaches in reducing food waste among farmers and non-governmental organizations (NGOs) in Sierra Leone. Collaborative efforts uniting diverse stakeholders such as government agencies, farmers, NGOs, and the private sector enable knowledge sharing, resource pooling, and the development of innovative, context-specific solutions (Ansell & Gash, 2008; Derqui et al., 2016). These approaches leverage tools such as technological innovations for agricultural by-products (Al-Hilphy et al., 2022), behavioral interventions targeting household waste (Aloysius et al., 2023), and the use of circular resources in food packaging (Ada et al., 2023) to build more sustainable systems. Reviewing literature and case examples, this study seeks to identify the key drivers, challenges, and enabling factors influencing the success of collaborative governance frameworks, providing insights to enhance food security and environmental sustainability in Sierra Leone and beyond.

1.1. Research Questions

- What are the key factors contributing to food waste at various stages of the supply chain?
- How do collaborative approaches involving farmers, NGOs, and government agencies influence food waste reduction in Sierra Leone?
- What challenges and opportunities exist within the collaborative efforts aimed at reducing food waste in Sierra Leone?

1.2. Research Objectives

- To identify and analyze the infrastructural, socioeconomic, and cultural drivers of food waste.
- To evaluate the effectiveness of collaborative governance frameworks in stakeholder engagement and promoting knowledge sharing.
- To explore the limitations and strengths of current collaborative initiatives.

2. Literature Review on Effective Collaboration in Food Waste Reduction

2.1. Introduction

Food waste is a multifaceted global challenge with profound environmental, economic, and social implications. Addressing this issue requires a comprehensive and collaborative approach involving various stakeholders across the food supply chain. This literature review synthesizes findings from multiple studies and reports to highlight the importance of effective collaboration in reducing food waste.

2.2. Definitions and Scope

The Food and Agriculture Organization (FAO) provides a comprehensive definition of food loss and waste, distinguishing between food loss (occurring from production to processing) and food waste (occurring at retail and consumer levels) (FAO, 2014). This definitional framework is essential for understanding the scope of the problem and identifying areas for intervention. The FAO's framework emphasizes that food loss and waste occur at different stages of the supply chain, requiring targeted strategies to address each stage effectively.

2.3. Theoretical Models

Two prominent theories underpin the study of collaborative approaches in food waste mitigation: systems theory and stakeholder theory.

2.3.1. Systems Theory

Systems theory provides a holistic framework for understanding complex problems by emphasizing the interconnectedness of components within a system (Meadows, 2008). In relation to food waste mitigation, it views the food system as an interdependent network encompassing production, processing, distribution, consumption, and waste management (Ingram, 2011). Effectively addressing food waste requires understanding how these parts interact and influence one another (Pruyt & Pruyt, 2007). Collaborative, cross-sector efforts enable stakeholders to grasp these system dynamics more comprehensively and create integrated, root-cause-oriented solutions (Parfitt et al., 2010).

2.3.2. Stakeholder Theory

Stakeholder theory emphasizes that organizations are accountable to all parties affected by their actions and must consider diverse interests in decision-making (Freeman, 2010). In food waste mitigation, this means engaging key stakeholders such as producers, retailers, consumers, policymakers, and environmental groups to ensure their perspectives are integrated into strategies (Derqui et al., 2016). Collaborative approaches based on this theory help identify and involve stakeholders in developing inclusive and effective solutions (Derqui & Fernandez, 2017). Early engagement and open communication foster trust, resolve conflicts, and enable the sharing of knowledge and resources (Bryson et al., 2015). Thus, stakeholder theory supports building cooperative, well-rounded approaches to reducing food waste.

2.4. Conceptual Framework

The conceptual framework of this study combines systems theory and stakeholder theory to analyze how collaborative approaches can effectively reduce food waste. It views the food system holistically, recognizing that waste arises at multiple interconnected stages—from production to consumption and that coordinated stakeholder involvement is essential for identifying root causes and intervention points. The framework emphasizes the importance of stakeholder engagement, where producers, retailers, consumers, policymakers, and others share knowledge, build trust, and develop mutually beneficial solutions. Effective collaboration depends on enabling factors such as strong leadership, clear governance, sufficient resources, and mechanisms for conflict resolution. Overall, the framework provides a foundation for understanding the processes, challenges, and strategies that underpin successful multi-stakeholder collaboration in mitigating food waste.

2.5. Collaborative Food Waste Mitigation Cycle

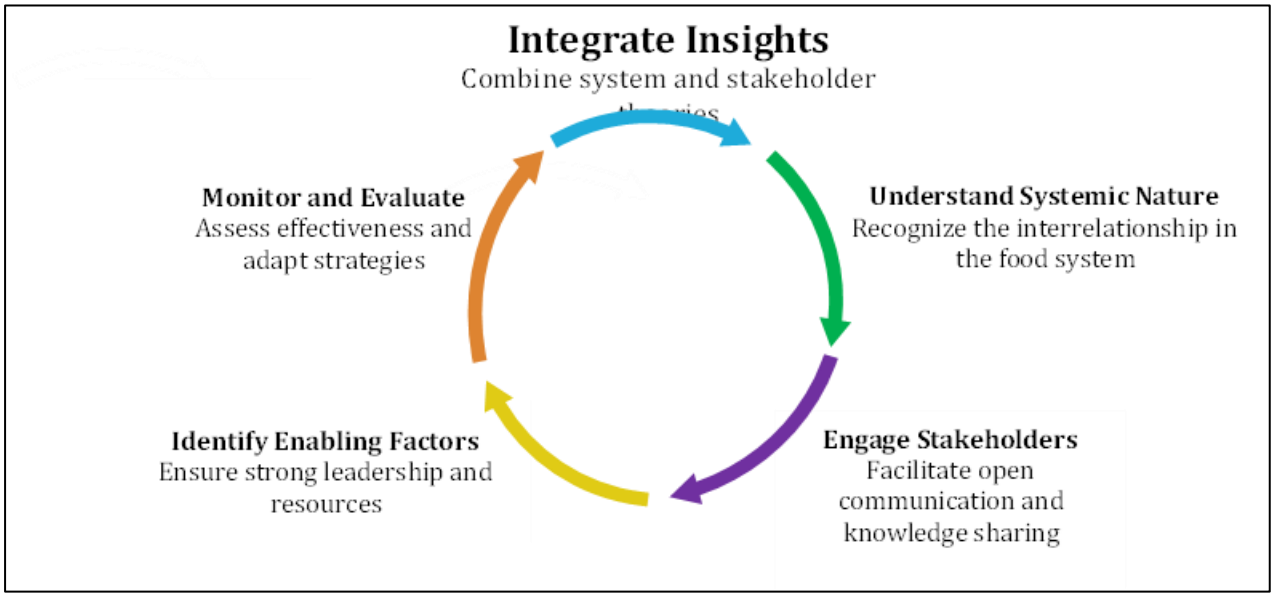

Figure 1 The Collaborative Food Waste Mitigation Cycle (FWC) (2025) by the author

3. Governing Complex Food Systems

Food systems are inherently complex, involving multiple actors with differing priorities, resources, and levels of authority (HLPE, 2014). Addressing challenges such as food waste, therefore, requires inclusive and coordinated action across various sectors. Collaborative governance (CG) offers a framework for achieving this by bringing together diverse stakeholders in consensus-driven decision-making processes, typically facilitated by a government body (Ansell & Gash, 2008; Emerson & Nabatchi, 2015). Through deliberation, stakeholders build trust, share knowledge, and identify cooperative strategies that enable mutually beneficial solutions (Koebele, 2020). This approach is particularly effective for tackling cross-boundary issues that transcend administrative or political jurisdictions (Guerrero et al., 2015).

However, collaborative governance can be demanding in terms of time, resources, and coordination. It may face challenges such as conflicts among participants or the creation of minimal-effort compromises that limit innovation (Koebele, 2020). The changes resulting from CG are often incremental and difficult to measure directly (Huxham, 1996a;

Koontz & Thomas, 2006). Hence, successful collaboration depends heavily on cultivating shared motivation, mutual trust, and a strong capacity for joint action among participants (Emerson & Nabatchi, 2015; Kossmann et al., 2016).

3.1. Causes of Food Waste

Food waste occurs throughout the food supply chain from production to consumption due to a combination of systemic inefficiencies and individual behaviors. Key factors include poor handling, inadequate storage, and lack of consumer awareness (Kader, 2005; Dou & Toth, 2021). Studies, such as Johnson et al. (2018), show that household over-purchasing and improper storage significantly increase waste. Post-harvest losses are another major contributor, with FAO (2010) estimating up to 30% losses in fisheries caused by limited infrastructure and inefficient processing. Addressing these issues requires improved value chain collaboration (Kruijssen et al., 2020).

At the household level, behaviors like poor meal planning, ineffective leftover management, and limited food literacy exacerbate waste (Aloysius et al., 2023). In farming, traditional practices, inadequate storage, limited market access, and weak infrastructure contribute to spoilage and financial loss (FAO, 2019; MAFFS, 2021). Poverty and lack of refrigeration in rural areas (UNDP, 2020) further hinder food preservation efforts, while cultural customs such as preparing excessive quantities for social events add to avoidable waste (WFP, 2021). Overall, reducing food waste in Sierra Leone requires integrated interventions addressing infrastructure gaps, market access, and consumer education.

3.2. Current Situation in Sierra Leone:

Food waste represents a major challenge in Sierra Leone, intensifying food insecurity and harming the environment. According to the UNEP and FAO (2021), about 37% of food produced in Sierra Leone is lost or wasted across the supply chain from production to consumption, placing the country among those with the highest food waste levels in Sub-Saharan Africa. Post-harvest losses are particularly severe, with around 30% of crops lost due to poor storage, inadequate handling, and inefficient transport systems (World Bank, 2019). In urban areas such as Freetown and Bo, household food waste is increasingly problematic. The Sierra Leone Urban Research Centre (2018) found that families in Freetown waste an average of 0.4 kg of food per day, largely due to poor meal planning, over-purchasing, and limited public awareness. The Ministry of Agriculture, Forestry, and Food Security (MAFFS, 2021) also reported that much of this waste ends up in open dumps, exacerbating pollution and public health threats.

The COVID-19 pandemic further worsened food waste through supply chain disruptions and market closures, especially for perishable goods (WFP, 2020). With 57% of the population living below the poverty line (UNDP, 2020), reducing food waste is essential to improving food availability for vulnerable groups and achieving Sustainable Development Goal 12.3, which seeks to halve global food waste by 2030. Efforts by the Government of Sierra Leone and the FAO have included farmer training, improved storage facilities, and post-harvest management initiatives (FAO, 2019). However, progress is hampered by limited data and research, making it difficult to design targeted interventions. Strengthening infrastructure, adopting better handling practices, and raising public awareness remain crucial steps toward reducing food waste, enhancing food security, and promoting sustainability in Sierra Leone.

3.3. Importance of Food Waste Mitigation: A Multi-dimensional Analysis

Food waste is a pressing global issue with far-reaching consequences for food security, economic stability, and environmental sustainability. Mitigating food waste is crucial for addressing these challenges and promoting sustainable development. The mitigation of food waste represents a critical intersection of food security, economic development, and environmental sustainability. According to the United Nations Sustainable Development Goals Report (2024), addressing food waste is fundamental to achieving multiple SDGs, particularly Zero Hunger (SDG 2), Responsible Consumption and Production (SDG 12), and Climate Action (SDG 13).

3.4. Global Initiatives and Policies

Several global initiatives aim to reduce food waste. The FAO's Global Initiative on Food Loss and Waste Reduction (2015) provides a framework for countries to develop strategies to reduce food waste. Similarly, ReFed's Food Waste Challenge (2021) offers a comprehensive approach to addressing food waste in the United States. These initiatives emphasize the importance of coordinated efforts at the national and international levels to drive systemic change.

3.5. Industry Collaboration

Collaboration across industries is essential for effective food waste reduction. A study by McAdams et al. (2019) evaluated food waste in restaurants and highlighted the need for cross-industry cooperation to implement best practices. The study found that collaboration between food service providers, suppliers, and policymakers can lead to

significant reductions in food waste. In fisheries, Kruijssen et al. (2020) emphasized the importance of value chain collaboration to reduce losses, particularly in low and middle-income countries.

3.6. Technological and Innovative Solutions

Innovative solutions such as circular food packaging and by-product valorization are emerging as effective strategies to reduce food waste. For example, a study by Ada et al. (2023) explored the challenges and opportunities of circular food packaging, emphasizing the potential for reducing waste through sustainable packaging solutions. Al-Hilphy et al. (2022) demonstrated the potential of ohmic heating to extract oil from fish by-products, highlighting the importance of technological innovation in addressing food waste.

3.7. Gender and Social Dimensions

Gender equity is an important aspect of food waste reduction. Nordhagen (2021) highlighted that involving women in agricultural value chains can significantly reduce post-harvest losses. This underscores the need for inclusive strategies that address social dimensions of food waste, ensuring that interventions are equitable and effective across different demographics.

3.8. Environmental and Climate Impacts

Food waste has significant environmental impacts, contributing to greenhouse gas emissions and resource depletion. Xue et al. (2021) showed that food loss and waste in China have increasing environmental impacts, emphasizing the need for sustainable practices. The study highlighted the importance of integrating environmental considerations into food waste reduction strategies to mitigate climate change.

3.9. Collaborative Approaches

Collaborative approaches involve collective efforts and partnerships among stakeholders to address a common goal or challenge (Ansell & Gash, 2008). In the context of mitigating food waste, these approaches involve the coordination and cooperation of various actors, such as government agencies, non-governmental organizations (NGOs), businesses, and community groups, to develop and implement effective strategies and solutions (Derqui et al., 2016). These collaborative efforts aim to leverage the diverse perspectives, expertise, and resources of stakeholders to address the multifaceted challenge of food waste.

3.10. Stakeholders

Stakeholders are individuals, groups, or organizations that have a direct or indirect interest in a particular issue or initiative (Freeman, 2010). In the context of food waste mitigation, stakeholders encompass a diverse range of actors, including government agencies, policymakers, food producers, processors, distributors, retailers, consumers, NGOs, and research institutions (Derqui et al., 2016). Effective collaboration and coordination among these stakeholders are essential for developing and implementing comprehensive and sustainable solutions to address food waste.

3.11. Collaborative Efforts in Food Waste Mitigation

Collaborative approaches are essential for tackling the multifaceted issue of food waste, bringing together governments, businesses, consumers, and civil society to create effective, inclusive solutions. Studies highlight the value of multi-stakeholder partnerships and public-private collaborations in developing integrated strategies and technologies to reduce food waste across the supply chain (Parfitt et al., 2010; Lipinski et al., 2013; Derqui et al., 2016). Successful initiatives, such as the *Love Food Hate Waste* campaign in the UK, demonstrate how coordinated efforts among government, industry, and NGOs can raise awareness and change consumer behavior (WRAP, 2021). However, collaboration can be hindered by conflicting interests, unequal power dynamics, and resource limitations (Ansell & Gash, 2008; Gray & Purdy, 2018). To ensure success, effective collaboration requires strong leadership, transparent communication, and mechanisms for trust-building and conflict resolution (Emerson & Nabatchi, 2015).

3.12. Building Collaborative Advantage

The concept of collaborative advantage, introduced by Huxham and Macdonald (1992), refers to the unique benefits organizations can achieve collectively that they could not accomplish individually. Achieving this advantage requires establishing a meta-strategy a shared framework of rules, goals, and responsibilities guiding all participants within the collaboration. For such collaboration to succeed, members must adhere to these agreed principles, ensuring coordinated and goal-aligned action. Effective monitoring mechanisms, developed with stakeholder input, are essential to maintain transparency, trust, and fairness, ensuring compliance with established rules (Ostrom, 1990; Ostrom, 2005).

Overall, collaborative advantage depends on mutual commitment, clear governance, and unbiased oversight among all partners.

4. Methodology

4.1. Research Design

This study employs a comprehensive literature review methodology to assess the effectiveness of collaborative approaches in mitigating food waste among farmers and NGOs in Sierra Leone. The literature review is designed to synthesize existing research, case studies, and reports that focus on collaborative efforts and their impact on food waste reduction. This approach allows for a broad understanding of the topic by examining a wide range of sources and identifying common themes, challenges, and successes.

4.2. Data Sources

The literature review draws from a wide range of sources, including peer-reviewed journals such as *Resources, Conservation and Recycling*, *Sustainability*, *Food Security*, and *Environmental Science & Technology*, to establish a strong academic basis. It also incorporates publications from leading international organizations like the FAO, WFP, and World Bank, as well as national bodies such as MAFFS and SLARI, to provide region-specific insights into food security and agricultural development. In addition, case studies and initiatives showcasing successful collaborative strategies for reducing food waste were reviewed to highlight practical, real-world applications. Comprehensive databases, including Google Scholar, JSTOR, and PubMed, were utilized to access diverse and up-to-date research materials. Collectively, these sources ensure a balanced, evidence-based assessment of current food waste mitigation efforts and the role of collaboration in strengthening food security.

4.3. Analysis

The analysis of the literature involved several steps: a systematic collection of articles, reports, and case studies that met the inclusion criteria. Identification of key themes and concepts within the literature, such as types of collaborative approaches, factors influencing effectiveness, and outcomes of collaborative efforts. Integration of findings from various sources to identify common trends, challenges, and successes in cooperative approaches to food waste mitigation. Assessment of the strengths and limitations of different collaborative approaches, considering factors such as stakeholder involvement, resource availability, and contextual relevance.

5. Findings

The findings of this study highlight the multifaceted nature of food waste (FW) in Sierra Leone and underscore the vital role of collaborative approaches in addressing this pressing challenge. The review of literature and empirical reports reveals that food waste in Sierra Leone manifests across all stages of the food supply chain, from production and post-harvest handling to distribution and consumption. These findings emphasize a complex interplay of infrastructural, socio-economic, technological, and behavioral factors that contribute to the incidence of waste, while demonstrating that collaborative interventions among farmers, non-governmental organizations (NGOs), and government agencies offer significant potential for sustainable mitigation.

5.1. Extent and Nature of Food Waste in Sierra Leone

Sierra Leone faces significant food waste challenges, losing approximately 30-37% of its annual food production primarily at the post-harvest stage (UNEP & FAO, 2021; World Bank, 2019). This substantial loss stems from three main structural deficiencies: inadequate storage infrastructure, poor handling practices, and limited market access. Rural food producers typically rely on traditional storage methods that provide insufficient protection against environmental threats like pests, moisture, and temperature variations (SLARI, 2018). The problem is compounded by poor transportation systems and the absence of proper cold chain infrastructure, which accelerates the deterioration of perishable goods.

Urban areas like Freetown and Bo contribute to the food waste problem through behavioral factors at the consumer and household levels. These include inadequate meal planning, excessive purchasing, and limited knowledge of proper food preservation techniques (SLURC, 2018; MAFFS, 2021). These patterns reflect broader socioeconomic trends, including rapid urbanization and insufficient consumer education about sustainable consumption. The COVID-19 pandemic further exacerbated these issues, as disruptions to supply chains and market restrictions resulted in widespread spoilage of fresh produce (WFP, 2020).

5.2. Socio-Economic and Cultural Drivers

The findings show that food waste in Sierra Leone is shaped not only by technological and logistical constraints but also by deep-rooted socio-economic and cultural factors. Widespread poverty, affecting over 57% of the population (UNDP, 2020) restricts investment in storage technologies, refrigeration, and other preservation mechanisms. Many smallholder farmers and low-income households lack access to reliable electricity and post-harvest handling systems, which in turn leads to preventable spoilage.

Cultural traditions, such as the preparation of large quantities of food for communal events and celebrations, often result in the discarding of uneaten portions (WFP, 2021). Likewise, limited literacy and awareness about food preservation contribute to inefficient household practices. Gender dimensions also play a vital role. Women, who constitute the majority of smallholder farmers and food processors, are disproportionately affected by post-harvest losses due to unequal access to resources, capital, and training (Nordhagen, 2021). Addressing food waste, therefore, requires gender-sensitive strategies that empower women and integrate their knowledge and perspectives into collaborative frameworks.

5.3. Effectiveness of Collaborative Approaches

The analysis identifies structured collaborative partnerships among diverse stakeholders—government agencies, NGOs, farmers, research institutions, and private sector entities—as essential for addressing Sierra Leone's complex food waste challenges. Research shows that initiatives based on collaborative governance (CG) principles (Ansell & Gash, 2008; Emerson & Nabatchi, 2015) significantly improve coordination, build trust among participants, and enable effective collective problem-solving. Successful international examples like the UK's Love Food Hate Waste campaign (WRAP, 2021) demonstrate that these collaborative approaches can be adapted to Sierra Leone's agricultural context. Within Sierra Leone, partnerships between the Ministry of Agriculture, Forestry, and Food Security (MAFFS), the Sierra Leone Agricultural Research Institute (SLARI), and international organizations such as FAO and WFP have yielded positive results. These collaborations have produced farmer training programs in post-harvest handling, introduced improved storage facilities, and developed pilot projects for community-based food preservation systems (FAO, 2019; WFP, 2021). However, despite these achievements, the study identifies significant limitations: collaborative efforts remain fragmented and underfunded, with weak institutional coordination, insufficient data-sharing mechanisms, and counterproductive competition among NGOs undermining the effectiveness of joint interventions.

To enhance collaborative governance, the study highlights critical enabling factors, including shared leadership, clearly defined roles, effective resource mobilization, and joint monitoring and evaluation frameworks. Literature in this field emphasizes that successful collaborative efforts must develop "shared motivation" among participants (Emerson & Nabatchi, 2015) a condition characterized by trust, mutual understanding, and collective commitment that sustains long-term collaborative action.

5.4. Technological and Innovative Pathways

Another key finding highlights the potential of innovation and technology in enabling effective collaborative food waste mitigation. Partnerships integrating local knowledge with modern technologies have shown promise in improving efficiency and sustainability. For instance, ohmic heating techniques for processing by-products (Al-Hilphy et al., 2022) and circular food packaging systems (Ada et al., 2023) illustrate how technological innovation can reduce waste while creating value-added products. However, such technologies remain largely inaccessible to smallholder farmers in Sierra Leone due to financial constraints and inadequate infrastructure. Collaborative frameworks that include public-private partnerships could facilitate access to affordable innovations, bridging this gap and promoting inclusive sustainability.

5.5. Environmental and Policy Implications

The findings further indicate that reducing food waste offers significant environmental and policy benefits. Food wastage contributes directly to greenhouse gas emissions and resource depletion, compounding the effects of climate change (Xue et al., 2021). Collaborative food waste reduction, therefore, aligns with global commitments such as the Sustainable Development Goals (SDG 12.3) to halve food waste by 2030. Nationally, addressing food waste could improve food security, reduce environmental pollution, and strengthen the resilience of the food system. Policy efforts must thus prioritize integrated interventions, combining infrastructure investment, awareness programs, and governance reforms to achieve measurable impact.

5.6. Conceptual and Theoretical Insights

The findings support the integration of systems theory and stakeholder theory as conceptual foundations for understanding collaborative food waste mitigation. A systems thinking approach recognizes the interconnectedness of

actors and processes across the food supply chain (Meadows, 2008; Ingram, 2011), while stakeholder theory emphasizes the importance of engaging multiple actors with diverse interests (Freeman, 2010). The study's conceptual framework posits that food waste reduction can be achieved most effectively when these perspectives are integrated, fostering shared understanding, participation, and adaptive governance. Hence, the Collaborative Food Waste Mitigation Cycle (FWC) proposed in this research provides a structured pathway for applying these theories in practice. It underscores continuous engagement, collective action, and feedback loops as essential components in achieving sustained reductions in food waste.

This study finds that food waste in Sierra Leone arises from a confluence of infrastructural deficiencies, socio-economic constraints, and behavioral practices. Collaborative governance provides a promising framework to address these challenges, though its success depends on resource availability, inclusive participation, and institutional coordination. Technological innovation, gender inclusion, and systems-based thinking are identified as critical enablers for sustainability. By fostering collaboration among farmers, NGOs, government entities, and the private sector, Sierra Leone can significantly reduce food waste, strengthen food security, and advance toward its sustainable development goals.

6. Conclusion

Sierra Leone faces significant food waste challenges, with approximately 30-37% of annual food production lost, primarily at the post-harvest stage due to inadequate storage infrastructure, poor handling practices, and limited market access. Rural areas struggle with insufficient preservation techniques and transportation systems, while urban areas like Freetown and Bo contribute to waste through poor meal planning, over-purchasing, and limited knowledge of food preservation. These challenges, exacerbated by the COVID-19 pandemic, have substantial implications for food security, income generation, and environmental sustainability in a country already facing economic constraints.

Collaborative approaches involving government agencies, NGOs, farmers, research institutions, and private sector entities offer the most promising strategy for addressing these multidimensional challenges. Evidence shows that initiatives based on collaborative governance principles enhance coordination, foster trust, and enable collective problem-solving that individual efforts cannot achieve. Partnerships between the Ministry of Agriculture, Forestry, and Food Security, the Sierra Leone Agricultural Research Institute, and international organizations have produced positive outcomes in farmer training, improved storage facilities, and community-based preservation systems, though these efforts remain fragmented and underfunded.

To strengthen these collaborative efforts, Sierra Leone must address key barriers, including weak institutional coordination, limited data-sharing mechanisms, and competition among NGOs. The research recommends establishing a unified national platform to harmonize policies and scale interventions, promoting technological innovation in post-harvest management, building capacity among farmers and communities, and raising public awareness about food waste impacts. Success requires a paradigm shift from isolated interventions to coherent, multi-stakeholder partnerships that combine traditional knowledge with technological innovation, ultimately contributing to Sustainable Development Goals related to zero hunger and responsible consumption.

Recommendations

- **Enhance** Collaborative Frameworks: Establish structured partnerships among farmers, NGOs, government agencies, and private sector stakeholders to foster collective action in food waste reduction. Initiatives should focus on clear communication, shared leadership, and coordinated strategies to leverage resources and expertise effectively.
- Invest in Infrastructure and Technology: Prioritize investment in storage facilities, transportation systems, and technological innovations that facilitate better preservation and management of food. Implement training programs for farmers on modern agricultural practices and waste-reduction techniques to improve overall efficiency in the food supply chain.
- Promote Public Awareness and Education: Launch awareness campaigns and educational programs aimed at consumers and producers to address behaviors contributing to food waste. By enhancing knowledge about proper food handling, meal planning, and the environmental impacts of waste, communities can be empowered to adopt more sustainable practices.

Compliance with ethical standards

Disclosure of conflict of interest

The authors declare that there are no conflicts of interest regarding the publication of this manuscript. All financial, personal, or professional relationships potentially influencing the research have been disclosed. Each author has contributed equally to the development of the article, and there are no competing interests that could have appeared to influence the results or interpretation of the study findings..

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