



WORKING PAPER

The role of faith-based organizations in tackling food loss and waste in Rwanda: A preliminary study

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HIGHLIGHTS

- Addressing food loss and waste (FLW) is considered critical to food security, economic prosperity, and climate resilience, especially for an African nation such as Rwanda, which loses 40 percent of its food supply annually.
- Faith-based organizations (FBOs) play an integral role in Rwandan society. Rwandan FBOs manage 30 percent of the nation's health facilities and 75 percent of schools—sectors that are considerably engaged in food systems.
- Most FBOs in Rwanda did not report having formal FLW reduction programs in place.
- FBOs identified limited skills, knowledge, and awareness as the top barriers to engagement in FLW reduction. Other sectors identified a lack of best practices, investment capital, and enabling food policy.
- Training, policy, research, and increased funding are identified as factors that could accelerate FBO action on FLW in Rwanda.

EXECUTIVE SUMMARY

Introduction

Malnutrition, hunger, and food insecurity are among the most important challenges facing African nations today. Although many in Africa face food insecurity, nearly 40 percent of food produced is lost or wasted, which exacerbates economic insecurity, wastes resources, and undermines food system sustainability. Faith-based organizations (FBOs) operate a wide range of institutions, such as schools or houses of worship, which can significantly contribute to reducing food loss and waste (FLW). Further, religious values have a proven influence over attitudes and behaviors regarding food consumption and waste.

About this working paper

This working paper examines the potential and actual contributions of FBOs to address FLW in Rwanda. Through a mixed-methods approach, this research examines current FLW efforts being implemented by FBOs, the barriers and opportunities to impact, and the ways FBO action might contribute to national FLW reduction goals. This paper explores the role of FBOs to address FLW, and it provides a set of recommended interventions to support FBOs in contributing to Rwanda's food system sustainability goals.

Key findings

Most FBOs surveyed considered FLW to be a relevant problem for their organizations and were able to identify areas for FBO engagement, such as improving knowledge, skills, awareness, and partnerships. This could include supporting communities and farmers in capacity-building within agricultural practices, postharvest handling, and waste management. Faith-based development agencies also emphasized the opportunity for community behavior change on FLW-related issues.

Although the FBOs surveyed reported commonsense handling of food purchases and investment in efficient agricultural practices, approximately 94 percent lacked specific programs on FLW reduction. FBOs cited limited skills, knowledge, and awareness as primary barriers to FLW engagement. All stakeholders interviewed (i.e., government, nongovernmental organizations [NGOs], etc.) identified the need for an improved understanding of the food policy and regulatory environment to enhance FLW reduction practices.

FBOs reported many ongoing mission-driven initiatives that support social and environmental well-being, indicating an opportunity to utilize existing institutional practices to facilitate FLW programming. All eight FBOs interviewed reported ongoing initiatives that supported agriculture, nutrition, education, women's empowerment, early childhood development, or health care. FBOs need an improved understanding of the relationship between FLW reduction and social and environmental issues to create a greater incentive to integrate FLW in core mission work.

A unique opportunity exists to institutionalize FLW principles within FBO leadership and national policies while embedding FLW initiatives within FBO programs. The research also highlights the potential for FBOs to engage in advocacy and lobbying efforts concerning FLW programs. NGOs emphasized the importance of educating FBOs on the right to food and sustainable agriculture, facilitating initiatives that actively promote FLW reduction.

The majority of FBOs surveyed consider strengthening partnerships among stakeholders as the primary contribution to national FLW objectives and international food security goals. FBO operations uniquely cut across the full spectrum of food system actors through collaborative activities with government, NGO, and private sector partnerships. Leveraging and strengthening these partnerships can greatly enhance national food system transformation objectives.

Recommendations

FBOs can become powerful agents of change in creating a more sustainable and efficient food system in Rwanda.

Realizing this potential requires a concerted and participatory approach among all food value chain stakeholders to identify "hot spot" areas along the value chain for FBO intervention in reducing FLW, to establish FLW baselines for select value chains and locations, and to implement strategic actions specific to FBOs to reduce FLW and measure progress toward targets. These following recommendations provide a road map for enhancing the engagement of FBOs in FLW reduction efforts:

- **Examine why and to what degree FLW is relevant to FBOs.** Engage with select FBOs in Rwanda to understand why and to what extent they consider FLW to be relevant to their institution and the degree to which they are engaged in the food system. This is critical for identifying accessible and relevant opportunities for intervention and potential impacts of reducing FLW.
- **Enhance FLW knowledge and awareness to demonstrate FBO mission alignment.** Provide information on FLW, including the findings from this report, to FBOs to demonstrate alignment between FLW reduction and FBO environmental and social missions. Work with FBOs to identify priority areas of intervention along the food value chain based on the FLW context of Rwanda and to leverage the enhanced knowledge of FBOs in this sector.
- **Integrate FBOs and FLW into the Rwandan government's food systems agenda.** Government should establish clear and consistent opportunities for FBO engagement in the country's food systems agenda while clarifying responsibilities among food system stakeholders. Government can also strengthen the institutional regulatory framework to encourage action and ensure compliance.
- **Enhance the capacity of FBOs as FLW actors.** Engage a multistakeholder group of FBOs and food system stakeholders to develop actions based on the priority areas of

intervention as part of the broader integration of FBOs and FLW into Rwanda’s national agricultural and food systems agenda. Deliver capacity- and skill-building activities to FBOs to implement these actions in partnership with public and private sector stakeholders.

- **Strengthen partnerships between FBOs and Rwanda food system stakeholders.** Establish a “faith and FLW” strategic advisory group made up of FBOs and key government, private sector, and NGO stakeholders to promote coherence and collaboration. The study also recommends creating a similar group at the district level, working closely with local partners for coordination among stakeholders.
- **Implement and monitor FBO-led FLW actions.** Implement actions developed through multistakeholder engagement and monitor effectiveness against established baselines. FBOs, together with government and NGOs, should consider developing a menu of evidence-based FLW solutions cataloging effective and accessible interventions for FBOs for knowledge sharing.

INTRODUCTION

Malnutrition, hunger, and food insecurity are among the most important challenges facing African nations today. In 2022 alone, an estimated 140 million people were acutely food insecure (WFP 2022). Although many in Africa face food insecurity, 37 percent of food produced is lost or wasted, which exacerbates economic prosperity, squanders precious resources, accelerates greenhouse gas emissions, and undermines food system sustainability (UNEP 2018). Tackling food loss and waste (FLW) across all stages of the food value chain is critical for lowering costs, increasing efficiency, reducing food supply emissions, and addressing food insecurity—key aspects of achieving the Sustainable Development Goals (SDGs) (United Nations 2019).

Stakeholders along the food value chain, including private and government actors, have implemented various approaches to confront FLW. This has included institutional frameworks, binding targets, behavior change campaigns, and fiscal measures (Pasarín and Viinikainen 2022). Although faith-based organizations (FBOs) have not been strongly involved in reducing FLW to date, research shows they are already engaged in social and environmental well-being efforts (Singh et al. 2023).

There is great potential for FBOs to contribute to FLW reduction. Religious values have a documented influence over attitudes and behaviors toward food consumption and food waste (Filimonau et al. 2022). Moreover, FBOs own and manage a range of institutions, including schools and hospitals,

Box 1 | Important definitions

- **Food value chain:** The complex and interconnected components of food production, processing, transport, distribution, and consumption. A holistic systems approach has more recently been adopted to better identify intervention points that can enhance food security.
- **Food loss:** Food that is lost along the food value chain and does not reach the ultimate consumer. Food loss typically occurs at the supply stage of the value chain, such as production, harvest, or transportation.
- **Food waste:** Food and associated inedible parts that reach the ultimate distribution or consumer channels in the desired quality but are discarded rather than consumed. Food waste occurs from retail to final consumption—the demand stages of the value chain.

Source: Ericksen 2008; UNEP 2021.

that intersect with the food services sector and are essential for nourishing communities. This working paper examines the underexplored potential of FBOs to address FLW through a preliminary study in Rwanda.

Achieving the SDGs through FLW reduction

Addressing FLW is considered a priority issue for tackling hunger, environmental degradation, and climate change (UNEP 2021). FLW reduction can include redistributing food to new or alternative markets; improving food management through transport and storage; improving supply chain management, including harvesting and packing methods; and many other technical, behavioral, and infrastructural interventions (Magalhães et al. 2021). This is critical to addressing the US\$1 trillion lost annually due to FLW across the globe, in addition to labor, water, energy, and lands invested in growing and harvesting food (WFP 2020).

Annual FLW rates amount to losing the nutritional energy to feed 1.9 billion people, demonstrating the importance of, and opportunity presented by, reducing these rates worldwide (Kummu et al. 2012). Reducing FLW is an essential part of achieving the SDGs, specifically SDG 12.3 (SDG 12 on responsible consumption and production), which aims to halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains by 2030. Reducing FLW can assist in maximizing the

value of agricultural land and ensuring sustainable resource use—both essential elements to a sustainable and prosperous future (UNEP n.d.).

Tackling FLW would also have repercussions for socioeconomic development, including doubling the net agricultural productivity and incomes of small-scale food producers (SDG 2 on zero hunger), enhanced infrastructure (SDG 9 on industry, innovation, and infrastructure), advanced technologies (SDGs 9 and 12), and fair and equitable business practices (SDG 8 on decent work and economic growth) (Kashyap et al. 2023). In fact, the Food and Agriculture Organization of the United Nations (FAO) considers FLW reduction to be “*the most efficient and feasible approach* in economic and environmental terms to increasing food availability and security, in comparison to increasing food production” (FAO 2015, 1; emphasis added). Although the FAO recognizes the importance of incorporating cultural and religious considerations for food value chain stakeholders and their capabilities to reduce FLW, further investigation is needed.

Faith and food behavior

Beyond spiritual well-being, many FBOs work to address the physical well-being of their membership and communities. Despite having limited acknowledgment in mainstream community development discourse (Willis 2013), FBOs can even be considered forerunners to modern nongovernmental organizations (NGOs) (Clarke and Ware 2015). FBOs conduct activities that align with regional development goals such as education, humanitarian aid, poverty alleviation, and health care (Singh et al. 2023). Moreover, as one of the most enduring personal values, religious beliefs shape attitudes, perceptions, and behaviors related to individual consumption choices and to food behavior specifically (Minton and Kahle 2017). For example, religious traditions might prescribe dietary choices, and people of faith may express their belief system through food choices (Coşgel and Minkler 2004; Filimonau et al. 2022). Notably, although many FBOs are sensitive to environmental and social concerns, there is limited research on the influence of religion on sustainability (Minton et al. 2020).

Prior research on the intersection of religious values and food behavior reveals mixed results. One body of literature contends that religiosity encourages food waste avoidance and plays a positive role in food waste reduction. For example, research in China, India, Lebanon, and Poland all demonstrate that religious belief is a significant driver for reducing food waste (Chammas and Yehya 2020; Dhar et al. 2021; Filimonau et al. 2022; Qian et al. 2022). In contrast, restrictive religious norms like fasting have been found to contribute to more food

waste. A systematic review revealed that between 25 and 50 percent of food prepared during Ramadan in some Arabic countries is thrown away, sometimes doubling the rate of food waste (Abiad and Meho 2018). Despite these findings, in general, there is “still no clear answer as to how religious versus non-religious consumers will see food waste” (Minton et al. 2020, 1248). Moreover, most studies focus on religious beliefs, resulting in limited research on the institutional role of FBOs in reducing FLW.

Aim of this working paper

The aim of this working paper is to investigate the current and potential contribution of FBOs in addressing FLW reduction in Rwanda. This applies to both institutional contributions as well as contributions to national FLW reduction targets. These are the guiding research questions:

- What are FBOs currently doing to address FLW in Rwanda?
- What are the barriers and opportunities to making impact?
- What interventions would be most effective in supporting faith actors’ contributions to national and global goals to reduce FLW?

This paper is among the first of its kind to explore the role of FBOs in addressing FLW, and it provides a set of recommended interventions to support FBOs in contributing to Rwanda’s FLW reduction goals. There is a particular opportunity among many FBOs to champion FLW because their organizational values are embedded in environmentally and socially conscious principles (UNEP Faith for Earth 2021).

METHODOLOGY

This working paper employed a mixed-methods approach that gathered and analyzed qualitative and quantitative information using an inductive thematic analysis approach regarding FBO engagement in FLW reduction. A narrative analysis was conducted to highlight the emergent and relevant findings.

Part I: Desk review

The desk review focused on existing research and policies relating to food security and FLW in Rwanda as well as the potential and actual contribution of FBOs to support food system transformation objectives. Information was obtained from open-access sources such as government websites as well as through the global research database of World Resources Institute (WRI).¹

Part II: Survey of Rwandan FBOs

A quantitative survey was conducted with representatives of Rwandan FBOs, including faith leaders and other staff (i.e., administration, management), to understand ongoing engagement, barriers, and opportunities for FLW reduction. Per government protocol, the survey was reviewed by the Rwanda Governance Board (RGB) and granted authorization prior to the start of data collection. Sample size was determined using a linear snowballing method² (the formation of a sample group started with one individual who provides information about another until we reach determined sample size). Using this approach, a sample size of 264 respondents was targeted. The research team reached 236 respondents, representing 89.39 percent of the targeted sample. The survey questionnaire (see Appendix A) was preloaded into tablets using KoboCollect version 2023.2.3. Survey data were collected between May and June 2023 by trained surveyors who actively used tablets to allow for a personalized and engaged data collection experience.

FBO survey respondents were recruited from Kigali City and Rwamagana, representing urban (high food waste potential) and rural (high food loss potential) settings, respectively. The majority of FBOs surveyed represented the urban perspective (78 percent), were affiliated with the Protestant faith (64 percent), and belonged to an umbrella organization (92 percent). Most respondents were male (86 percent) and held one or more university degrees (82 percent). The majority of FBO respondents (68 percent) did not report having an affiliated agency (i.e., Caritas or Compassion International).

In terms of FBO institution type, survey responses included 131 houses of worship; 22 umbrella organizations; 15 faith-based development agencies; 11 hospitality, 7 education, and 4 interfaith networks; 2 NGOs;³ and 1 health care facility. Lastly, regarding participant role, half (50 percent) of all FBO representatives surveyed were faith or spiritual leaders (i.e., pastors, imams), 19 percent were FBO staff (i.e., project managers, legal representatives), 17 percent were FBO leaders (i.e., directors, executive staff), 4 percent were part of a religious community (e.g., nuns), 2 percent were “other,” and 7 percent were “unspecified.” See Appendix B for full details on survey participants.

Part III: Key informant interviews

Primary data collection for key informant interviews (KIIs) consisted of interviews with various stakeholders, including eight FBO representatives, eight government officials, two national or international NGOs, and two private sector entities. KIIs were conducted in two distinct phases, totaling 20 interviews. All FBO, NGO, and private sector informants were male, and

four government officials were female. The initial phase of KIIs (December 2022–January 2023) were dedicated to stakeholders at the national level, whereas the second phase (February–March 2023) focused on local district-level representation of the same entities. Of the 20 interviews, 85 percent took place with informants based in Kigali City, representing the urban perspective. See Appendix C for the interview guide used and Appendix D for interview participant details.

Part IV: Case studies

Two case studies explored the extent to which FBOs address FLW in specific contexts. Case study selection was randomized among relevant FBOs with the potential for food production (food loss) and food consumption (food waste). The cases were also chosen to represent Rwanda’s urban and rural districts and involved focus group discussions with FBO staff alongside physical visits and observations. Case study guides are presented in Appendix E.

Case study I: Faith-based farmers cooperative

The first case study was conducted with the Gwiza RWA34 farmers cooperative located in the rural Rwamagana District (Eastern Province), where employment is dominated by independent farmers and agroforestry covers 85 percent of the district’s total area (Government of Rwanda 2018). In Rwanda, farmers’ cooperatives act as intermediaries between farmers and markets and employ quality control measures to meet market standards. The cooperative is a beneficiary of a project known as the “Catalysing Market Prospects for Horticulture Smallholder Farmers and Small and Medium Enterprise.” This five-year (2020–25) initiative was implemented by the Christian FBO African Evangelistic Enterprise (AEE) in partnership with Farm Concern International and Tearfund, a Christian international relief and development agency. The cooperative nominated individuals, including farmers, traders, and those in leadership roles, totaling nine cooperative members (four female and five male) who participated in focus group discussions in June 2023.

Case study II: Faith-based hotel

The second case study was conducted with the three-star faith-based Sainte Famille Hotel located in the Nyarugenge District of Kigali City, established by the Catholic Church and operated in accordance with Catholic faith and values. The hotel features 70 guest rooms (with 60 percent occupancy during the high season and 40 percent occupancy during the low season) as well as conference facilities. Discussions were held with hotel management and a local waste management company in June 2023.

Approvals and guidance

This research received preauthorization from the RGB and engaged a strategic advisory group consisting of 18 high-level representatives from FBOs, government, NGOs, and the private sector. Both groups provided guidance on the project direction, study design, and interpretation of results. In April 2023, preliminary research findings and conclusions were presented to the strategic advisory group for feedback, which was incorporated into this report. The RGB also provided feedback on the report during the external review period.

Ethics

WRI's human subjects protection team reviewed all project documentation pertaining to the inclusion of human subjects, including the interview guides, informed consent procedures, and related documentation. Based on its professional assessment of risks to human subjects, it was determined that the project involves minimal risks to human subjects and is exempt from additional requirements given its planned data handling, questions asked, methods used, and the way results are presented. This decision aligns with WRI's adherence to US standards for human subjects research reviews set forth by the US Office of Human Research Protections.

Limitations

A major limitation to this work was the accessibility to and sample size of research participants. Across research methods, most participants were male, likely due to historical and structural decisions that tend to exclude females from top leadership roles in FBOs (Pew Research Center 2016). This paper's survey sample was also overrepresented by institution (houses of worship), participant role (spiritual or faith leaders), and denomination (members of the Protestant faith), likely due to the snowball sampling method. These limitations may make the results of this working paper less applicable; for example, houses of worship may not engage with food systems in the same way as other institutions like schools or hotels.

Another limitation to this work was the scope of the study. This initial exploration of faith and FLW revealed that more time and dedicated resources are needed to achieve impact, although this study has already provided important insights. Moreover, the research team was limited in its ability to build on established literature due to the novel nature of the FBO and FLW research intersection. Despite these limitations, this working paper provides preliminary insights in a niche area and has established fruitful relationships with key actors in the sector for future work.

RESEARCH FINDINGS

Literature and data review

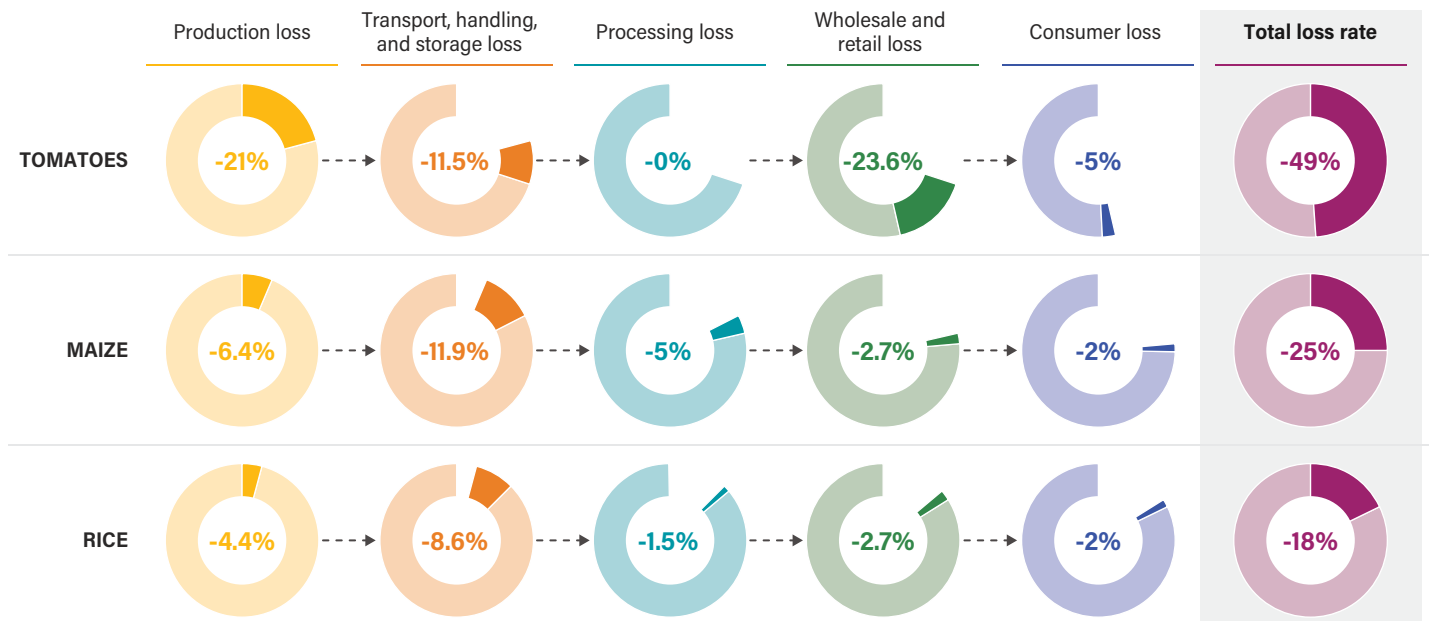
FLW in Rwanda

Agriculture is central to Rwanda's economy, contributing 39 percent of gross domestic product, 80 percent of employment opportunities, and 63 percent of foreign exchange earnings as of 2014 (USAID 2018). Nearly 90 percent of households in Rwanda practice traditional subsistence agriculture (Government of Rwanda 2020), and over 70 percent of women and 49 percent of youth are employed in agriculture (NISR 2022a). Rwanda experiences at least two main staple seasons every year, with a third available in the marshlands for the cultivation of rice and vegetables and a possible fourth with irrigation (NIRDA 2019; USAID 2018). Despite the high level of involvement in the agricultural sector by the local community, approximately one-fifth of Rwanda's population is food insecure (WFP 2018).

An estimated 40 percent of Rwanda's food supply is lost during the postharvest stage (3 million tons annually), and this rate changes dramatically depending on commodity type (see Figure 1). For example, perishable commodities like tomatoes experience loss throughout the food value chain, whereas staples like maize experience the most loss during transport (World Bank 2020). Rwanda also produces an estimated 141 kilograms (kg) of household food waste per capita per year (nearly 2 million tons per year) (UNEP 2024). Notably, the United Nations Environment Programme (UNEP) has reported an increased convergence in average per capita household food waste across country income groups, whereby waste levels vary by only 7 kg per capita. UNEP considers food waste to be a universally urban issue, which is true in Rwanda's capital and largest city, Kigali, where 68 percent of municipal solid waste is organic (Isugi and Niu 2016).

Rwanda has committed to FLW reduction, aligning the country's development plan with the SDGs and other critical commitments (see Appendix F). FLW reduction has been identified as a key opportunity for ensuring food availability, accessibility, affordability, and safety while mobilizing a strategic pathway to transform national food systems (MINAGRI 2021). Since an estimated 30 percent of the country's population is expected to reside in urban areas by 2050, FLW issues are expected to increase as changes to spending and dietary choices further compound food security challenges (World Bank 2020). Reducing rates of FLW is an essential element of sustainable food production identified by the Republic of Rwanda for enhancing food quality, reducing emissions, and minimizing land degradation (MINAGRI 2021).

Figure 1 | **FLW percentages in Rwanda's tomato, maize, and rice food value chains**



Source: World Bank 2020, 12.

Faith actors and food in Africa

FBOs are understood broadly to include entities that derive their mission and activities from religious or spiritual beliefs and principles. FBOs encompass a wide range of institutions and facilitate an extensive list of social services related to health care, education, food security, migration, and poverty reduction. Moreover, shared identity and principles implicit in faith communities equip FBOs with an unparalleled network of trusted authority. A survey of 34 African countries conducted between 2016 and 2018 found that religious leaders are more widely trusted than any other group of public leaders (i.e., army, courts, government, police) (Howard 2020). This gives African FBOs a unique opportunity to leverage these trusted networks toward positive environmental and social change broadly and around food specifically.

Across the continent, FBOs participate in all aspects of the food system, including the provisioning of livestock, seeds, training, and financial assistance (Caritas Food n.d.; Pegna 2023). Farming God’s Way, a food security development intervention founded in 1984 in northeast Zimbabwe, promotes the system known as conservation farming. Since its founding, it has expanded globally and resulted in improved crop yields, soil health, and climate change adaptation (Dryden 2022). The African Sisters Education Collaborative is estimated to have served over 2.3 million people across the continent through

various livelihood projects, such as the improvement of nutrition and food security through farmer groups and credit access that has simultaneously advanced income generation, poverty alleviation, and access to education (ASEC 2022). Beyond income or marketable skills, religious values may even bring a qualitatively different conceptualization of human empowerment compared to secular civil society organizations by being more deeply rooted in notions of dignity and hope (Tyndale 2000).

Despite ongoing participation with food systems, FBOs remain on the sidelines when it comes to reducing FLW. In fact, “religious communities” are only mentioned once in the FAO’s 2022 international code of conduct for FLW reduction (Pasarín and Viinikainen 2022). Inadequate connection or coordination between farmers and processing units, such as information asymmetry, has been identified as the top influential factor impeding FLW action (Kashyap et al. 2023). Meanwhile, research with maize farmers in Rwanda revealed that farmer group membership, access to credit, and access to training—all central tenets to FBO food actions—were influential factors in the use of alternative storage technologies to address postharvest losses (Benimana et al. 2023).

An overview of FBOs in Rwanda

As of 2015, there were 277 national FBOs registered by the RGB (Maurice 2015). The RGB oversees the registration of these organizations and coordinates their activities at the national level, working closely with the Ministry of Local Government to ensure effective implementation and oversight of their programs.⁴ At the district level, the Joint Action Development Forum (JADF) exists to “ensure a sustainable socio-economic development and improved service delivery for Rwandan communities through active participation, dialogue, accountability, sharing information, and effective coordination of stakeholders’ interventions in decentralized entities” (Government of Rwanda 2015). FBOs are active members of the JADF and participate in district-wide programs and projects focused on education, health care, and community development.

FBOs in Rwanda have created several bodies, forums, and mechanisms to achieve their goals, and they are considered civil society organizations that are also integrated into government-created structures such as the Sector Working Groups and the Joint Sector Review. FBOs in Rwanda also manage considerable assets, including 30 percent of the nation’s health facilities and 75 percent of schools, both sectors that are engaged considerably in the food system (Maurice 2015; NISR 2022b). Moreover, the majority (97 percent) of Rwanda’s population is religiously affiliated, and 67 percent of these adherents are Christian. By gender, 98 percent of women and 96 percent of men in Rwanda identify as religious (NISR 2022a).

Current FBO practices to address FLW in Rwanda

Role of FBOs in local life

KIIs revealed that FBOs operate diverse services that contribute to Rwanda’s development, including schools, hospitals, local businesses, sanitation, literacy programs, and loan programs, with a particular emphasis on vulnerable households and marginalized populations. Collaboration between FBOs and health ministries has played an essential part, for example, in Rwanda’s anti-HIV efforts, including prevention campaigns and resource access (Maurice 2015). FBOs also play a crucial role in food security interventions. Over half of KIIs identified food system interventions specifically, such as nutrition, food security, or agricultural interventions, as central contributions of FBOs to local life. FBOs distribute assets such as cows under the “One Cow per Poor Family” (Girinka) program, provide small livestock to families, and establish kitchen and school gardens. These services are carried out by FBOs and affiliated agencies as well as their umbrella organizations.⁵ FBOs in Rwanda also have

a recognized role in food security broadly, but it has yet to be revealed whether this relates to FLW specifically.

FLW initiatives in place by Rwandan FBOs

Overall, 83 percent of survey respondents reported FLW as a relevant problem for their organization. The majority in almost every denomination and respondent type identified FLW as a problem. Additional research is needed to understand the reasons why and to what degree FLW is considered relevant by FBOs. Although there is much enthusiasm on the topic, when asked whether the organization had any programs to reduce FLW, the majority of the FBOs surveyed (96 percent) reported they do not currently have FLW initiatives in place identified as such (see Appendix G). Interestingly, representatives of the same FBO gave conflicting answers (both yes and no), suggesting that the understanding of FLW varies. Table 1 below outlines FLW reduction programs by institution type.

KII results for FLW reduction

KIIs indicated that FBOs exhibit substantial participation in areas such as education and health in Rwanda. Indeed, FBOs have historically focused on initiatives tied to development and humanitarian aid. Among key informants, all eight FBOs reported ongoing initiatives that supported agriculture, food security, nutrition, education, women’s empowerment, early childhood development, or health care. For example, the Anglican Church discussed the recent Anglican green movement launched in Rwanda in 2021 whereby faith channels such as schools and youth clubs are utilized to implement environmental teaching and activities (Mash 2021). These findings indicate an existing infrastructure capable of facilitating FLW programming at both local and national scales.

KIIs revealed details about ongoing FLW initiatives implemented by Rwandan FBOs. The Adventist Development and Relief Agency (ADRA) is supporting farmers on postharvest handling and storage techniques, specifically by providing tools to reduce food loss in the vegetable value chain. FBOs such as the Association of Baptist Churches in Rwanda (Association des Églises Baptiste au Rwanda; AEBR) and the AEE are also focusing on reducing food loss by providing farmers with training and equipment to improve postharvest handling practices. Other interventions reported by FBOs included training farmers in agronomic practices, implementing improved postharvest techniques, facilitating agro-input distribution,⁶ connecting farmers to markets, and managing food waste in various institutions. This research suggests that interest and action on FLW is nascent but growing, with several organizations, includ-

Table 1 | **Food loss, food waste, and FLW programs implemented by FBOs**

FBO INSTITUTION TYPE	NUMBER OF FLW-SPECIFIC PROGRAMS BY RWANDAN FBOS			TOTAL INSTITUTION TYPES
	Loss	Waste	None	
House of worship	1	0	130	131
National umbrella organization	2	1	19	22
Faith-based development agency	1	0	14	15
Hospitality	0	3	8	11
Education	0	1	6	7
Interfaith network	0	0	4	4
Nongovernmental organization	1	0	1	2
Health care	0	0	1	1
Total FLW programs	5	5	183	193

Notes: FBO = faith-based organization; FLW = food loss and waste. Responses in this table are grouped by institution due to multiple survey answers from the same FBO.

Source: Authors.

ing ADRA, the AEBR, and the AEE, leading programs that directly address the issue. FBO engagement on FLW in Rwanda is, therefore, mixed; however, this preliminary study suggests that the majority of FBOs see FLW as a relevant issue where their institutions can make a unique contribution.

Case study results for FLW reduction

One proven example of FBO intervention effectiveness is demonstrated by the Gwiza RWA34 farmers cooperative case study. Operating on a land area of 263 hectares, the faith-based cooperative focuses on cultivating chili peppers, French beans, onions, and pineapples. Members (farmers) bring their produce to the cooperative, where it is inspected by staff or quality controllers based on agreed standards.⁷ During Season B (January–April 2023), it was observed that chili peppers (7 percent) and French beans (6 percent) experienced the most loss from farm to destination, whereas pineapples and onions had relatively negligible losses (see Appendix H for full details). Cooperative members attributed the damage to various factors, including pests and bad weather, but they noted that the horticulture supply chain still operated in an unregulated environment characterized by an absence of mechanisms controlling the pricing of critical inputs like seeds and pesticides and a lack of clear and enforced standards for postharvest handling.

To address these ongoing challenges, the cooperative received postharvest handling materials such as crates and clean sacks as well as a pepper-drying machine and a cold room from

the European Development Fund and other drying facilities donated by the World Bank (see Figure 2). The cold storage facility is highly valued by cooperative members because it helps maintain the quality of products over time. However, it comes with a significant cost: members pay \$60 per month for electricity to sustain it.

Figure 2 | **Drying facility donated by the World Bank for Gwiza RWA34**



Note: This photograph was taken in June 2023.

Source: Authors.

The cooperative has also provided members with training on supply chain management, established Village Savings and Loan Associations to improve members' livelihoods, and introduced contract farming, which is a system wherein farmers (producers) and buyers agree in advance on the terms and conditions of production (quality) and marketing (price) of farm products to create new opportunities and reduce risk. These interventions are key for cooperative members, who have expressed concerns about the quantity of products rejected by the buyers, which they believed could be attributed to stringent quality standards and inadequate postharvest handling.

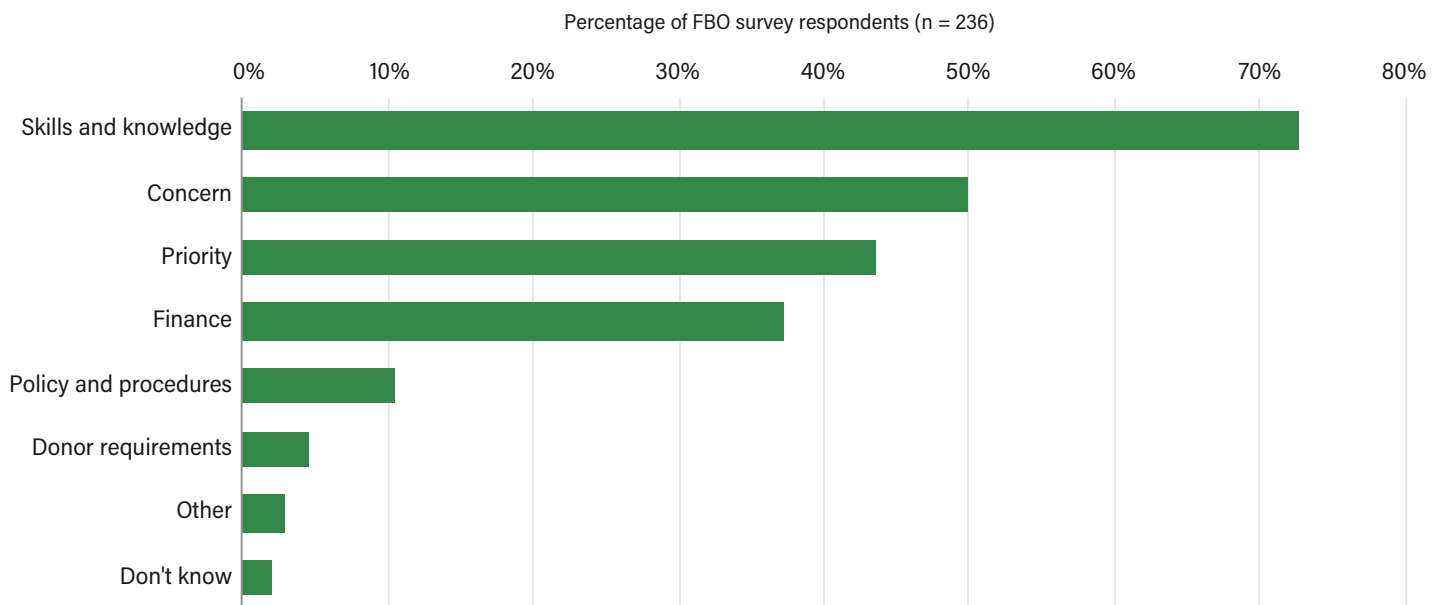
In contrast to the above interventions, the case study with Sainte Famille Hotel revealed no explicit FLW reduction measures in place. It did, however, cite strategies that reduce FLW. For example, food delivery is received by refrigerated trucks to ensure quality and avoid spoilage. Waste removal is conducted daily by an external company for \$100 per month. Discussions with hotel staff and a local waste collection company estimate that the hotel generates about 170–180 kg of food waste daily, or over sixty tons of food waste per year. Although hotel staff separate waste prior to collection (i.e., kitchen, dry, and garden waste), there is no specific program to reduce FLW at the faith-based hotel.

Barriers to FBO engagement in FLW reduction

The above findings contribute to answering the first research question outlined in this working paper regarding current FLW practices. Across denomination and institution type, our research shows that the engagement of FBOs in FLW reduction in Rwanda varies. Whereas some FBOs are actively involved in addressing FLW, others have yet to fully engage in such initiatives. This mixed engagement underscores the complex landscape of FLW involvement among FBOs in Rwanda, influenced by factors such as varying levels of familiarity with FLW issues, institutional capacity, and the presence of opportunities and constraints explored in this section. This section examines the major barriers to effective FLW reduction—as reported by FBOs—to better understand the limited engagement reported above.

Survey results revealed that the biggest barrier to FLW engagement was a lack of skills and knowledge, reported by 73 percent of the respondents (see Figure 3).⁸ This was followed closely by “not concerned” (i.e., FLW should be addressed by other sectors, such as government) or “not a priority” (i.e., faith-related or institutional activities took priority), which limited FBO engagement.

Figure 3 | **Barriers to focused/specific FLW engagement identified by FBO types in Rwanda**



Notes: FBO = faith-based organization; FLW = food loss and waste.

Source: Authors.

KII barriers to FLW

KII results reinforce survey findings. All sectors interviewed reported that a lack of skills, awareness, and capacity among FBOs was the primary barrier to FLW engagement. There was an emphasis among KIIs on postharvest handling and the skills required to adequately construct or use FLW technologies such as drying facilities. Government officials mentioned a lack of FLW awareness among decision-makers at the local level, and JADF representatives indicated that limited data were available to inform decision-makers and investors willing to support FLW engagement in Rwanda. The private sector and NGOs similarly expressed the need for accessible portals of best practices to scale FLW initiatives across Rwanda.

Government officials also noted a lack of knowledge on the impact of FLW on social and environmental development. They cited the need for research on traditional farmer knowledge and its contributions to new FLW technologies, as well as broader integration of FLW in agriculture education and research. FBOs and government officials identified inadequate information on financing opportunities and a low involvement from the private sector, whereas private sector informants discussed a lack of investment capital for FLW programs, land titling, and farmers' collateral to access loans.

Other barriers identified by KIIs included insufficient facilities and infrastructure, such as storage or better roads. Lastly, across all sectors, key informants identified the need for an improved understanding of the food policy and regulatory environment to better engage smallholder farmers and FBOs in FLW management, food quality standards, and food security. Representatives from all sectors cited a lack of specific and coherent food system policies and incentives to directly involve FBOs along the food value chain. See Figure 4 for a word cloud of frequent terms used by key informants to describe barriers.

Case study barriers to FLW

Case study data furthered these findings. Members, staff, and exporters from the faith-based farmers cooperative noted that a lack of information, finances, technology, facilities, and regulation contributed to food loss. Despite receiving equipment donations, these FLW interventions did not meet full demand for postharvest facilities, nor did they reach all farmers in the community due to resource and capacity constraints. As such, the cooperative case study points to the importance for more regulatory approaches that go beyond the individual FBO.

Regarding the faith-based hotel, the general manager attributed food waste to unidentified demand (i.e., variability of guest preferences), overstocking, overcooking, and large portion sizes.

Figure 4 | **Word cloud of frequent terms used to describe FLW engagement barriers**



Note: The larger the font, the more times the topic was mentioned by key informants. Word location has no significance.

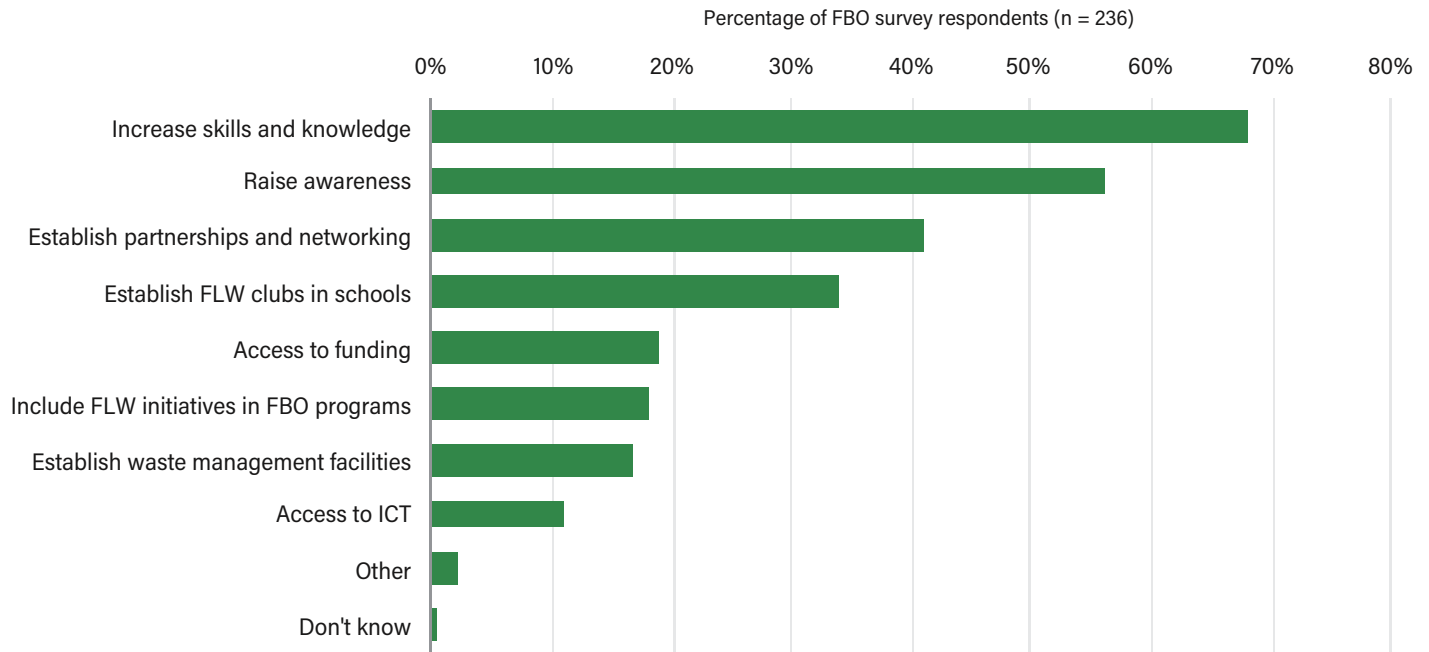
Source: Authors, created on wordclouds.com.

A lack of knowledge and experience in food waste management among hotel employees was also cited. This lack of expertise leads to financial costs for the hotel and affects its overall operations. The hotel also incurs expenses related to wasted labor costs during food storage and preparation activities as well as postservice food waste disposal. Additional research is needed to quantify the financial burden of food waste to this and other FBO operations.

Opportunities for FBO engagement in FLW reduction

Acknowledging the barriers to FLW engagement identified above, this section presents opportunities for supporting FBOs in FLW reduction uptake. Survey respondents identified increasing skills and knowledge (68 percent), raising awareness (56 percent), and establishing partnerships (41 percent) as the top three strategies to support FBO engagement in FLW reduction (see Figure 5).

Figure 5 | Opportunities for FLW engagement identified by FBOs in Rwanda



Notes: FBO = faith-based organization; FLW = food loss and waste; ICT = information, communication, and technology essential for agricultural recordkeeping, developing networks and databases, and addressing counterfeit (AGRA 2020).

Source: Authors.

KII opportunities for FLW

The KIIs provide details regarding the kinds of skills, knowledge, and networks needed for FBO engagement in FLW reduction. Supporting communities and farmers in capacity-building within agricultural practices, postharvest handling, and waste management were key areas of intervention. FBOs highlighted the importance of training and supporting local farmers to reduce waste and improve postharvest management practices. Faith-based development agencies emphasized the opportunity for community behavior change on FLW and the importance for FBOs to integrate food waste reduction principles into their own organization. Government officials identified the possibility to institutionalize FLW principles at FBO leadership and national levels as well as incorporate FLW initiatives into FBO programs.

In addition to internalizing such efforts, FBOs and private sector key informants also pointed to coordination between sectors (government, private) and across scales (district, national) to better allocate resources and prioritize effective FLW practices. Government officials cited advocacy and lobbying by FBOs for the effective implementation of FLW government programs.

NGOs described the possibility for education and program formation on the right to food and sustainable agriculture among FBOs, promoting initiatives that practice and mobilize FLW reduction. Raising awareness among the general population about the extent of FLW in Rwanda and its impact on livelihoods and the environment was a key intervention area identified for FBOs. Across the various sectors in Rwanda, there is a clear recognition of established FBO infrastructure to effectively advocate for and integrate FLW reduction strategies in a meaningful way.

Case study opportunities for FLW

Case study findings also outlined opportunities for FBO engagement in FLW reduction. The case studies showcased the diversity in FBO institution type, from agricultural cooperatives to hospitality services. Beyond spiritual guidance or humanitarian relief, FBOs manage a considerable assortment of physical assets, demonstrating the massive potential impact on FLW reduction. For the faith-based farmers cooperative, cross-sectoral collaborations among FBOs and development agencies had a

direct and positive impact on the cooperative’s ability to address FLW and brought additional benefits, such as employment opportunities and increased member income. Collaboration across sectors should be considered a key aspect for FBOs to address FLW.

The faith-based hotel (Figure 6) could build the capacity of hotel employees specifically, and greater organizational culture and awareness more broadly, to effectively tackle food waste issues. This may include training FBO leadership to understand the financial burden of FLW and justify investment in employee training. Hotel staff and clients can build the skills to identify sources of food waste and understand the negative consequences of wasting food—not only environmental but social and economic implications as well. At an operational level, mechanisms can be put in place to measure and reduce food waste. The hotel case study exposed a significant gap in FBO operations and the opportunities available to integrate and internalize FLW principles to better align with its faith-based mission and values.

FBO contributions to national and global FLW goals

Beyond opportunities to increase FBO engagement of FLW reduction, research participants were also asked about the potential contribution of such engagement to Rwanda’s national FLW development objectives (see Appendix F). The majority of FBO respondents (73 percent) identified strengthening partnerships among stakeholders, such as government actors,

farmers, private sector actors, and other related development partners as the primary contribution to FLW development goals (see Figure 7). FBOs have trusted and reliable social development infrastructure that uniquely intersects across sectors and scales. KIIs revealed several ongoing collaborations that could be strategically leveraged in this regard, such as the JADF’s ongoing efforts to strengthen the quality of local community life in partnership with FBOs.

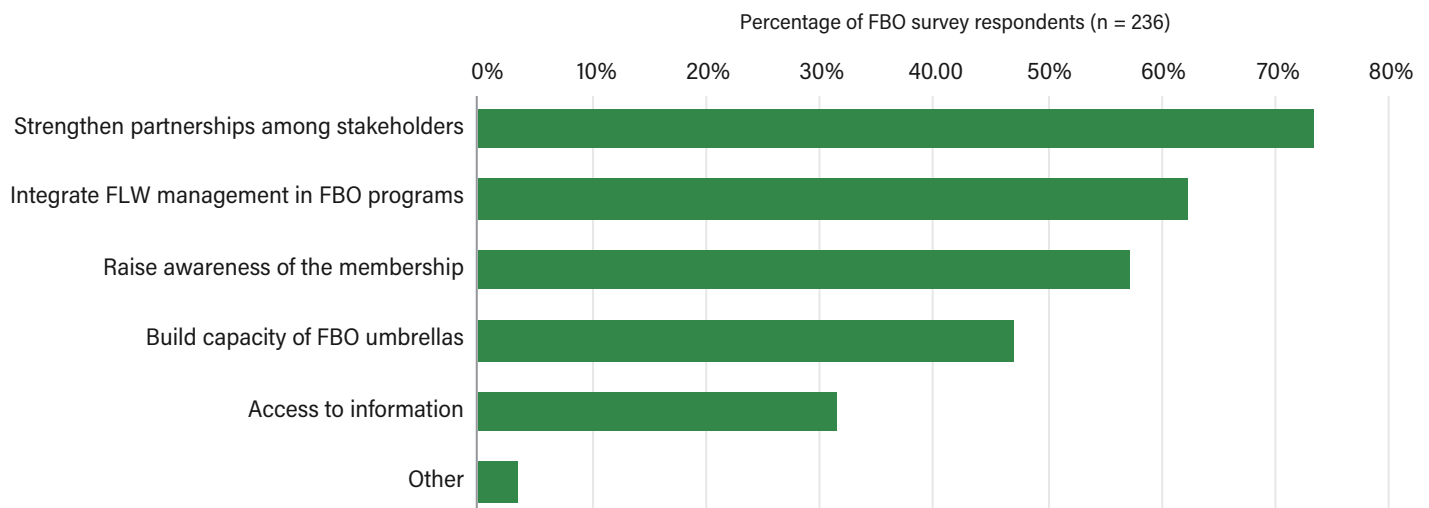
Figure 6 | **Sainte Famille Hotel in Kigali**



Note: This photograph was taken in June 2023.

Source: Authors.

Figure 7 | **Potential FBO contributions to national and global FLW goals**



Notes: FBO = faith-based organization; FLW = food loss and waste.

Source: Authors.

Contribution of youth and women to FLW reduction goals

To achieve national FLW objectives, resources and training opportunities must be made accessible across populations—especially vulnerable groups such as women and youth. As mentioned earlier in this paper, over 70 percent of women and 49 percent of youth are employed in the agricultural sector (NISR 2022a). Women play a central role in postharvest operations such as drying or storage, as well as food purchase and preparation, and are often in charge of commodity trade in certain value chains, such as fruit or fish. Youth-owned agribusiness is considered a pivotal catalyst for economic development in Rwanda and Africa (Heifer International 2021). The 2021 Labour Force Survey found that women are relatively more engaged in informal agriculture holdings and market-oriented agriculture (52.5 percent) than both men (47.5 percent) and youth (36.6 percent) (NISR 2022b). Moreover, 51 percent of Rwanda’s population is female, and about 98 percent of these women are affiliated with a religion (NISR 2022a). There is thus much potential for both women and youth FBO members to contribute to FLW reduction goals.

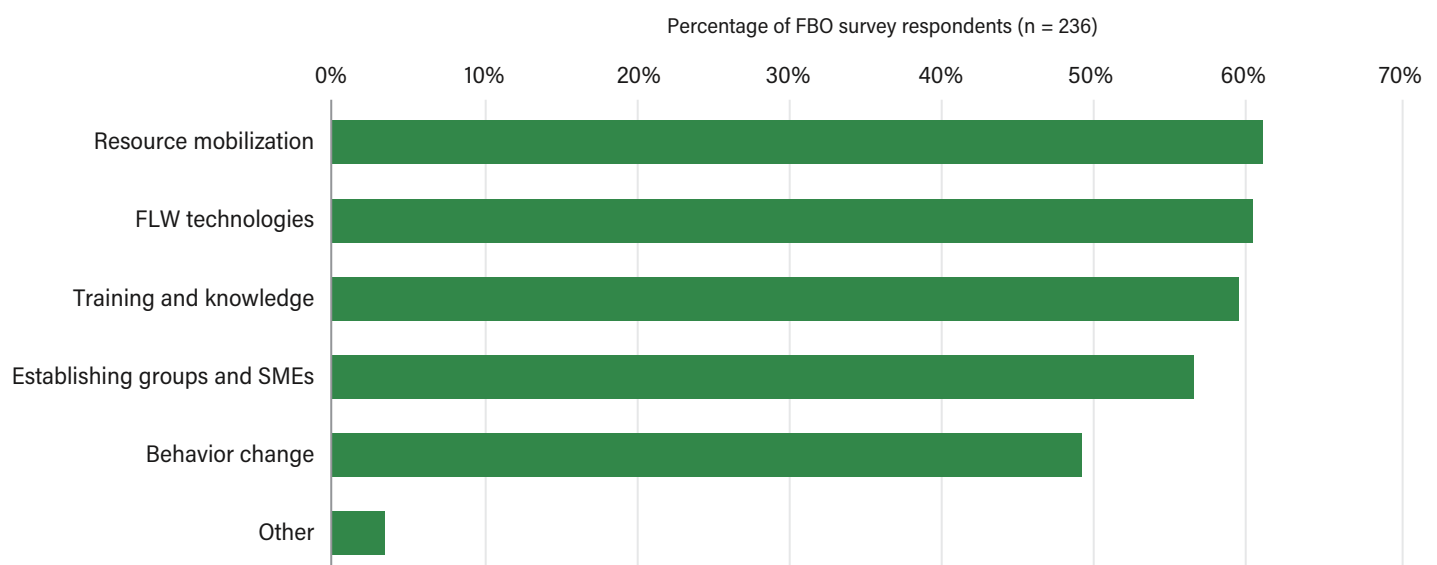
FBOs surveyed identified a number of possible contributions by women and youth FBO members to FLW reduction (see Figure 8). Resource mobilization (61 percent) and engaging in FLW technologies (60 percent) were the top two contributions, fol-

lowed closely by training and knowledge, establishing youth and women groups and small and medium-size enterprises (SMEs), and behavior change. In this initial scoping study it was not feasible to include additional questions on topics of gender, but this is a high priority for future research.

Interestingly, out of all the sectors represented in the KIIs, only government officials and the private sector identified the significant role of women and youth in mobilizing FLW reduction strategies. FBOs and NGOs did not indicate this in the interviews, even though one faith-based development agency reported women’s empowerment as an ongoing program. Interview questions did not focus on the role of women specifically, so it is notable that the topic was raised. The private sector identified the significant role of women and youth to overcome FLW issues through training and resources, supporting the above survey outcomes. A representative from one of the largest private waste management companies in East Africa noted that young people often enter the labor market poorly educated and lacking the necessary skills required for FLW technologies. There is thus an essential skills gap that must be met in order to empower adequate youth engagement in FLW reduction.

In that regard, government officials discussed the capacity-building of women and youth in terms of strengthening

Figure 8 | **Contribution of youth and women to FBO engagement of FLW reduction**



Notes: FBO = faith-based organization; FLW = food loss and waste; SME = small and medium-size enterprise.

Source: Authors.

entrepreneurial skills as well as skills for FLW reduction, communication, and promotion, particularly among farmers. Government officials identified engaging women and youth through savings and SME groups, and a local government actor described the opportunity presented by FBOs with higher learning institutions to work in collaboration with organizations for youth and women to conduct community-level research and increase knowledge on FLW practices. All sectors in the KIIs reported a lack of engagement among agri-food SMEs in FLW reduction due to the lack of capacity and start-up capital and the absence of regulatory guidance. This preliminary research reveals the opportunity to collaborate with ongoing FLW efforts and food value chain actors, particularly through the empowerment of youth and women, to achieve FLW reduction goals.

DISCUSSION

Although the influence of religious values on FLW behaviors needs clarity, this research is among the first of its kind to explore the potential and actual contributions of FBOs to FLW reduction. Our findings suggest that FBOs in Rwanda have mixed FLW engagement. A few institutions, such as ADRA, the AEBR, and the AEE, are actively engaged, but others—even a majority—are not presently engaged in explicit FLW reduction programs. The discussion below elaborates on these findings in the context of relevant literature.

Limited skills and knowledge (73 percent of FBOs) and a lack of specific concern (50 percent of FBOs) were identified as the top barriers to engaging FBOs in FLW reduction in Rwanda. Literature on factors affecting food waste generation among consumers and organizational actors echo these findings, identifying insufficient knowledge, skills, and awareness as underlying factors that can result in food waste (Yetkin Özbük and Coşkun 2020). Management perception, staff training and awareness, and organizational culture contribute significantly to the underlying factors of FLW in the organizational setting (Balaji and Arshinder 2016; Betz et al. 2015; Sonnino and McWilliam 2011). For example, management may consider staff training to be costly or may lack strategies to manage overproduction or set inventory policies (Yetkin Özbük and Coşkun 2020). For FBOs, knowledge, skills, and organizational policy therefore can play a crucial role in reducing FLW.

Regarding food loss, improved access to agricultural facilities and infrastructure such as storage was another key barrier identified by FBOs in the KIIs. Although temperature is the single most important factor in maintaining produce quality postharvest (Prusky 2011), only 5 percent of firms in Rwanda's national agriculture sector have refrigerated trucks, and only

9 percent have a cold room to store fresh produce (NIRDA 2019). Rwanda's agricultural sector is primarily rainfed and is increasingly exposed to weather extremes, and these challenges are compounded by erosion and degradation. These risks prompt farmers to overplant crops and seek intermediaries to transport more food than “necessary,” causing additional losses due in part to risk perception and realities and further amplified by facility shortages (World Bank 2020). FBOs can leverage ongoing efforts like agricultural cooperatives and training programs to increase the uptake of alternative crop storage practices (Benimana et al. 2023). However, sustained investments are required to address the drivers of FLW; KIIs revealed that inadequate information and a lack of investment capital prevent FLW reduction uptake. There is a need to demonstrate with practical guidance how FLW reduction could become part of the overall mission of FBOs, which will depend on cost-benefit analyses to identify when finance can be self-sustained and where grants would be necessary to bring about change.

Despite these barriers, 83 percent of FBOs stated that FLW was relevant to their operations and identified several opportunities for improving FLW engagement. These opportunities align strongly with actions identified by the FAO to address the systemic causes of FLW, including education, training, promotion of public-private partnerships, and access to finance (Pasarín and Viinikainen 2022). Importantly, across KIIs there was clear recognition of established FBO infrastructure that could effectively implement and integrate FLW reduction strategies institutionally and within ongoing programming. Although 94 percent of participating FBOs did not have FLW reduction programs in place, they are already conducting meaningful community development activities such as nutrition education through cross-sector collaborations, which signifies much potential for expanding these activities to FLW reduction. Though FBOs play a significant role in Rwanda's socioeconomic development, there is relatively little collaboration across umbrella organizations, leading to inefficiencies and wasted resources. Partnerships and networking were the third most identified interventions to support FBO engagement in FLW, and the majority of FBOs surveyed consider the strengthening of partnerships among stakeholders as the primary contribution to national FLW objectives and international food security goals.

The FAO states that the above FLW measures require adequate institutional, policy, and regulatory frameworks that incentivize the adoption of good practices (Pasarín and Viinikainen 2022). This aligns strongly with the cross-sectoral call across KIIs for an improved understanding of the food policy and regulatory environment in Rwanda. All sectors interviewed cited a lack of specific and coherent food system policies and incentives as well as inadequate information on financing opportunities. Indeed,

FLW concerns are not generating effective incentives or policies to discourage wasteful practices; instead, some are found to indirectly encourage food waste (FAO 2015). Any FLW training efforts must therefore go beyond the operational contributions of FBOs to reduce FLW and address regulatory questions of responsibility, resources, and processes.

Additional studies should consider gender dynamics and other social drivers at play in food system operations in Rwanda. A recent analysis of food loss for nationally prioritized staple crops in Africa found the visibility, voice, and experience of women is central to successfully tackling food security issues (Totobesola et al. 2022). Poor infrastructure and limited decision-making power over farming responsibilities have led to an unfair distribution of work, adoption of improper storage practices, and ultimately food loss. The analysis of Totobesola et al. demonstrates how access to equipment, facilities, and decision-making power among women can considerably reduce food loss and situates women as critical stakeholders in FLW management and food security more broadly. Engaging women in FLW reduction opportunities can also contribute to SDG 5 on gender equality. Sex-disaggregated data collection in food system projects is thus a key component for tackling FLW issues in Rwanda, across Africa, and globally.

Knowledge barriers to FLW engagement included the need for accessible data and best practices to inform and scale FLW initiatives across Rwanda. Global food waste data are consistently low, and FLW measurement approaches have been variable, making it difficult to compare across entities, sectors, or regions. The most comprehensive food waste data collection effort has doubled the amount of data points since 2021, but most data are not derived from nationally representative baseline studies (UNEP 2024). UNEP could not confidently report on food waste for any low-income countries, and data in the food service and retail sectors was highly concentrated in high-income countries. FLW reduction efforts conducted by FBOs can substantially contribute to the ongoing challenge of food waste estimates in the food service sector. UNEP (2024) provides a methodological guidance that can support entities like schools and hospitals operated by FBOs with food service provisioning. Future research should investigate the financial burdens of FLW to develop additional motivation for action.

RECOMMENDATIONS

FLW is a promising area of engagement for FBOs to more holistically operationalize their values to make substantial social and environmental change. It is likely that FBOs are taking FLW action, whether in supporting the adoption of efficient agricultural processes and technologies or better managing food in kitchens, even if they do not characterize it as such. Therefore, we recommend that an explicit program would create an opportunity to improve the current situation. Interventions from FBOs, government, private sector actors, and NGOs are needed to enhance the engagement of FBOs in FLW reduction.

Examine why and to what degree FLW is relevant to FBOs.

Engage with select FBOs to examine whether they consider FLW to be relevant, the extent to which they are engaged in food systems, their unique needs and priorities as they relate to food systems, and the comparative advantage of FBOs in addressing FLW in Rwanda.

Enhance FLW knowledge and awareness to demonstrate FBO mission alignment. Provide FBOs with information on FLW, including this report, to demonstrate alignment with their environmental and social missions. Work with FBO representatives to identify priority areas of intervention along food value chains.

Integrate FBOs and FLW into the Rwandan government's food systems agenda. Government should clarify responsibilities among food system stakeholders and establish more clear and consistent opportunities for FBO engagement. Government can also strengthen the institutional regulatory framework to encourage action and ensure compliance.

Enhance the capacity of FBOs as FLW actors. Establish FBO baselines for FLW within priority areas of intervention. Deliver capacity- and skill-building activities to FBOs to implement these actions in partnership with public and private sector stakeholders. FLW reduction skills could include technical training that is codeveloped in a way that enhances communication and advocacy and accounts for a variety of FBO contexts (e.g., house of worship vs. school).

Strengthen partnerships between FBOs and Rwanda food system stakeholders. To achieve the above in a collaborative and participatory manner, the study recommends establishing a “faith and FLW” strategic advisory group made up of FBOs and key government, private sector, and NGO stakeholders. The Rwanda Interfaith Council (RIC) or Rwanda Interfaith Council on Health (RICH) might serve as the central organizing body for this group, and its activities may feed into the multistakeholder engagement platform of the Circular Food Systems for Rwanda project.⁹ The study also recommends creating a similar group at the district level, working closely with the JADF and RIC platforms and other partners for coordination among stakeholders. Engage this multistakeholder group to develop actions based on the priority areas of intervention, tailored to specific FBOs, regional contexts, and value chains.

Implement and monitor FBO-led FLW actions. Implement FLW actions developed through multistakeholder engagement and monitor effectiveness against established baselines. Based on these experiences, FBOs, NGOs, and government should consider developing a menu of evidence-based FLW solutions for FBOs and cataloging effective and accessible interventions for knowledge-sharing. NGOs can partner with research institutions to develop best practice portals. Governments could invest in public infrastructure and provide incentives for investments to reduce FLW. The private sector could finance the adoption of low-cost technologies through pilot projects and support further research into the role of FBOs in addressing FLW.

CONCLUSION

FBOs in Rwanda possess significant potential to contribute to FLW reduction by virtue of the assets they manage. This is evidenced by the early examples of FBO forerunners in their FLW programs. A challenge, however, is the limited integration and participation of FBOs in national food system sustainability priorities, which may hinder their proactive engagement in FLW initiatives. To address this, it is crucial to foster a concerted, participatory approach involving FBOs, government, the private sector, and other stakeholders.

Such an approach should bring FBOs together with other key food system stakeholders to introduce FBOs to the findings from this working paper and details on FLW in Rwanda, including where it takes place along the value chain, opportunities for intervention, and the impacts of reducing FLW; engage FBOs in identifying locations along the food value chain where they can make the greatest impact, connecting to values-based approaches and comparative advantages of FBOs; and recruit FBOs to make commitments to pursue a target-measure-act approach in their institutions (Flanagan et al. 2019).

Central to these efforts is the provision of targeted technical assistance and capacity-building initiatives for FBOs and the communities they serve. Additionally, the establishment of multifaith, cross-sectoral strategic advisory groups at national and district levels will enhance collaboration and support among diverse stakeholders. Outputs from these initiatives should include the development of tailored guidance for FBOs on integrating FLW reduction practices into their operations, alongside an evidence-based menu of solutions. Moreover, this study’s research outcomes on the experiences of FBOs in Rwanda can serve as a catalyst for further action, promoting a more cohesive and impactful approach to FLW reduction initiatives across the country.

Ultimately, by addressing these recommendations and fostering greater collaboration, Rwanda can harness the full potential of its FBOs to contribute significantly to the national goal of reducing FLW, thereby advancing the country’s goals for a sustainable food system transformation.

APPENDIX A: FBO SURVEY QUESTIONNAIRE

Dear participant,

WRI and KAICIID, in the context of the African Union's 2022 theme on nutrition, are launching a collaborative project to study the role of faith-based organizations and religious leaders in tackling FLW in Rwanda. The study was approved by the RBG, the institution in charge of FBOs. Our team is conducting a baseline scoping phase to better understand the context of FBO engagement on food security in Rwanda, including desk review of existing research and initiatives; stakeholder interviews with key partners, including faith leaders; and case studies to understand how faith actors in Rwanda engage in FLW.

This questionnaire has been designed to help the team consultants, led by Jules Kazungu, to collect the relevant information. You have been purposefully identified and selected to participate in this assignment by answering this questionnaire in your capacity as a partner or religious leader. The information you provide will be treated with strict confidentiality and will serve the unique purpose of this assignment. Your response to the following questions will be highly appreciated.

Section A: FBO identification

1. Province: a) Kigali b) East c) other
2. District: a) Gasabo b) Kicukiro d) Nyarugenge d) Rwamagana
3. Gender: a) Male b) Female
4. Education level: a) Primary b) Secondary c) University d) Other
5. Name of local church/mosque/parish:
6. Function of the respondent within the local church/mosque/parish:
7. FBO religious affiliation: a) Muslim b) Catholic c) Association of Pentecostal Churches of Rwanda) Adventist c) Other Protestants d) Other
8. Do you belong to any umbrella organization: a) Yes b) No
 - a. If yes, what is the name?
 - i. Protestant Council of Rwanda (CPR)
 - ii. Episcopal Conference of Rwanda (CEPR)
 - iii. Alliance des Eglises Evangéliques au Rwanda (AER)
 - iv. Forum of Born Again Churches and Organisations in Rwanda (FOBACOR)
 - v. Sel et Lumière
 - vi. Peace Plan
 - vii. National Unity Fellowship of Pentecostal Churches
 - viii. Rwanda Interfaith Council
 - ix. Rwanda Muslim Community
 - x. Rwanda Interfaith Council on Health
 - xi. Federation des Eglises Reformee au Rwanda (FERR)
 - xii. Chri-Islam
 - xiii. Other
 - b. If yes, which type?
 - i. International
 - ii. National
9. Does your FBO have a partnership with developing agencies (i.e., Caritas, Compassion)?
 - a. Yes: Name of agencies
 - b. No

Section B: Key questions

10. Do you have any program or project in reducing food loss/waste?
 - a. Loss
 - i. What are your organization's current interventions in reducing food loss?
 - b. Waste
 - i. What are your organization's current interventions in reducing food waste?
 - c. Both
 - i. What are your organization's current interventions in FLW?
 - d. None
11. If yes to Question 10, where in the chain does most of the food loss occur?
 - a. Farm loss
 - b. Harvest
 - c. Postharvest
 - d. Storage
 - e. Transport
 - f. Packaging
 - g. Processing
 - h. Wholesale
 - i. Retail
 - j. Other
12. If yes to Question 10, where in the chain does most of the food waste occur?
 - a. Plate waste
 - b. Kitchen trimmings
 - c. Water deposits
 - d. Waste collectors
 - e. Other
13. What are the gaps and barriers to engaging FBOs in the food system, including the reduction of food waste?
 - a. Not a priority
 - b. Not concerned
 - c. Limited skills and knowledge
 - d. Limited access to finance
 - e. Donor requirements
 - f. Policy and procedures
 - g. Other
14. What are the opportunities and interventions that would be most effective in supporting faith actors to reduce FLW?
 - a. Raising awareness
 - b. Include FLW initiatives in FBO programs
 - c. Access to information, communication, and technology (ICT)
 - d. Access to funding
 - e. Partnership and networking
 - f. Increase skills and knowledge on the topics
 - g. Establishment of FLW clubs in schools
 - h. Establishment of waste management facilities
 - i. Other
15. What can be the contribution of youth and women members of FBOs to address FLW?
 - a. Establishment of youth/women groups and SMEs
 - b. Engaging youth/women in FLW technologies
 - c. Engaging youth/women in resource mobilization
 - d. Training and knowledge
 - e. Behavior change toward FLW
 - f. Other
16. What are the potential contributions of FBOs to the Rwandan objectives of reducing food waste and promoting food security?
 - a. Strengthen the partnership with the Government of Rwanda and other development partners
 - b. Integrate FLW management in FBO programs
 - c. Capacity-building of FBO umbrellas
 - d. Access to information
 - e. Raising awareness of the members
 - f. Other
17. Any other suggestions or recommendations?

APPENDIX B: FBO SURVEY PARTICIPANT DETAILS

Table C1 | Targeted and surveyed FBO respondents by religious affiliation and geography (N = 236)

	DISTRICT	PENTECOSTAL (%)	ADVENTIST (%)	ANGLICAN (%)	CATHOLIC (%)	MUSLIM (%)	OTHER PROTESTANTS (%)	TOTAL (%)
Urban	Gasabo	10	1	0	6	5	67	89
	Kicukiro	3	3	2	13	4	43	68
	Nyarugenge	5	2	1	2	4	12	26
Rural	Rwamagana	6	1	3	5	8	30	53
Totals	Target	25	20	20	25	20	154	264
	Surveyed	24	7	6	26	21	152	236
	Achieved	96	35	30	104	105	99	90

APPENDIX C: KII GUIDE

1. First, we would like to hear about your project or programs, and then key insights and lessons learned and the policy/enabling environment's impact on FLW.
2. What are existing policies and strategies to support the reduction of FLW in Rwanda?
3. How does your organization/project engage in FLW?
4. Are there any policy or regulation barriers that currently reduce opportunities for more circular practices by agri-food SMEs, including FBOs?
5. Are there any key considerations that we should consider, in terms of risks and/or opportunities in policy changes?
6. What are the most pressing issues in Rwanda, and in the region, as related to FLW?
7. What are the gaps and barriers to engaging FBOs in the food systems, including the reduction of FLW?
8. Do you have any program/project working with faith organizations on food loss (postharvest handling and storage) and waste in your area? If yes, explain.
9. In your perspective, how do FBOs and religious institutions play a role in local life?
10. What are the hurdles to engaging FBOs in FLW reduction work?
11. What are the opportunities and interventions that would be most effective in supporting faith actors' contributions to reducing FLW?
12. What role would you like to see FBOs play in supporting FLW?

APPENDIX D: KEY INFORMANT PARTICIPANT DETAILS

	KEY INFORMANT CHARACTERISTICS	N = 20	PERCENT
Location	Kigali City		
	Gasabo	10	50
	Nyarugenge	5	25
	Kicukiro	2	10
	Eastern Province		
	Rwamagana	3	15
Gender	Male	16	80
	Female	4	20
Institution type	Government official	8	40
	Faith-based development agency	5	25
	Spiritual services (i.e., church)	3	15
	Private sector	2	10
	NGO	2	10
Participant role	Organizational leadership (i.e., director)	7	35
	Senior staff (i.e., executive secretary)	6	30
	Staff (i.e., officer)	5	25
	FBO leadership (i.e., director)	4	20
	Faith or spiritual leader (i.e., priest)	2	10
	FBO staff (i.e., project manager)	1	5

APPENDIX E: CASE STUDY GUIDES

Section A: Identification

1. Demographic information: Province, district, sector, name, education, age, gender, name of FBO/agency
2. Function of the respondent
3. FBO affiliation: Muslim, Catholic, Protestant, Adventist, Other
4. Umbrella organization?
5. Focus area: Food loss or food waste

Section B: Key questions

Food loss

6. What are your current interventions in reducing food loss?
7. Do you see any food loss in food supply?
8. If yes, where in the chain does most of the food loss occur?
 - a. Farm loss
 - b. Harvest
 - c. Postharvest
 - d. Storage
 - e. Transport
 - f. Packaging
 - g. Processing
 - h. Wholesale
 - i. Retail
9. *On the farm.* Describe the kinds of crops and animals that are typically grown/raised here? Are there any losses that affect the quality of food produced? If so, which one? How much of the crop is damaged at this stage (kg)?
10. *Harvest.* Describe the techniques used for harvesting—types of materials, tools, or machines. At this stage, do you have any losses that occurred and solutions? How much (kg) of the crop is damaged at this stage?
11. *Postharvest treatments.* What kinds of postharvest treatments are used? Could you possibly estimate the quantity of food losses (kg) at this stage?
12. *Transport and packaging.* What kind of packages are you using? What amounts and types of losses are observed/reported? At this stage, do you have any losses that occurred?
13. *Storage.* How is the product stored? At this stage, do you have any losses that occurred and solutions? Could you possibly estimate the quantity of food losses (kg) at this stage?

14. *Transport.* What kind of transportation do you utilize? How and for what distance is produce transported? At this stage, do you have any losses that occurred and solutions? Could you possibly estimate the quantity of food losses (kg) at this stage?
15. What are the main causes of food loss?
 - a. Unsuitable harvest timing
 - b. Harsh climatic conditions
 - c. Lack of tools in harvesting and handling practices
 - d. Pests and diseases
16. Does damage/loss in quality adversely affect the price of the crop to a large extent?
17. What is the percentage of the price reduction?
18. What are the gaps and barriers to engaging FBOs in the food systems, including the reduction of food waste?
19. What are the opportunities and interventions that would be most effective in supporting faith actors' contributions to reducing FLW?
 - a. Mobilization
 - b. Include FLW in the food systems in their programs
 - c. Capacity-building
 - d. Funding
 - e. Coordination
 - f. Increase skills and knowledge on the topics
 - g. Others
20. What are your current interventions to reduce food loss?
21. Do you think food waste is a problem for you?
22. Do you see any food waste in the food supply?
 - a. Unsold food from retail stores
 - b. Transport
 - c. Uneaten prepared food
 - d. Plate waste
 - e. Kitchen trimmings
23. From your perspective, what are the main causes of food waste?
 - a. Poor purchase planning
 - b. Poor in-home storing or stock management
 - c. Preparing too much food
 - d. Lack of knowledge on how to use leftovers in recipes
 - e. Time management
 - f. Customer preference
 - g. Food safety
24. Is the food shelf-stable or perishable in your institution?
25. Where does the food waste go?
 - a. Trash/landfill
 - b. Compost
 - c. Burned
 - d. Repurposed for food or nonfood users
 - e. Water deposits
 - f. Waste collectors
26. Do you have some companies that collect food waste in this area?
 - a. If yes, are there any challenges working with them? If so, what challenges?
 - b. If not, how do you specifically manage food waste?
27. What is the monthly cost associated with the management of food waste in your company?
28. What are the gaps and barriers to engaging FBOs in the food systems, including the reduction of food waste?
29. What are the opportunities and interventions that would be most effective in supporting faith actors' contributions to reducing FLW?
 - a. Mobilization
 - b. Include FLW initiatives in FBO programs
 - c. Capacity-building
 - d. Funding
 - e. Coordination
 - f. Increase skills and knowledge on the topics
 - g. Others

Food waste

20. What are your current interventions to reduce food loss?
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 - f. Increase skills and knowledge on the topics
 - g. Others

APPENDIX F: AFRICA AND RWANDA'S FLW REDUCTION OBJECTIVES AND RELEVANT SDG GOALS

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS 2 AND 12	AFRICAN UNION AGENDA 2063	MALABO DECLARATION	RWANDA'S NATIONALLY DETERMINED CONTRIBUTION
<p>SDG 2: "By 2030, end hunger and ensure access by all people . . . to safe, nutritious and sufficient food all year round . . . end all forms of malnutrition . . . double the agricultural productivity and incomes of small-scale food producers" (Targets 2.1–2.3).^a</p> <p>SDG 12: "By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses" (Target 12.3).^b</p>	<p>"Consolidate the modernization of African agriculture and agribusinesses, through scaled up value addition and productivity, and by 2063: completely eliminate hunger and food insecurity" (Call to Action 72e).^c</p>	<p>III. Commitment to ending hunger in Africa by 2025:</p> <p>"Accelerate agricultural growth by at least doubling current (2014) agricultural productivity levels by 2025" (Commitment 3a).</p> <p>"Halve the current (2014) levels of Post-Harvest Losses by the year 2025" (Commitment 3b).^d</p>	<p>"Promote the recycling of organic waste in soil fertilizers (agriculture)."</p> <p>"Commercial scale composting, increased food production and nutrition security (waste reduction measures)."</p> <p>"Increased use of organic waste in soil fertilizers. Increased use of rice husks as fuel (manufacturing)."^e</p>
7 YEARS GOVERNMENT PROGRAMME: NATIONAL STRATEGY FOR TRANSFORMATION (NST1) 2017–2024	MINISTRY OF AGRICULTURE AND ANIMAL RESOURCES STRATEGIC PLAN FOR AGRICULTURE TRANSFORMATION 2018–24		
<p>"Work with the private sector to build post-harvest handling and storage facilities across the country and to add value to agricultural produce (processing)."</p> <p>"Develop waste management systems in cities, towns and rural areas."^f</p>	<p>"Food losses and waste occur along the entirety of the value chain, from post-harvest handling (e.g., spillage, crop damage), including distribution and processing stages (e.g., aflatoxin contamination during storage), to the consumption level (e.g., spoilage, household waste). This is due to a combination of lack of skills and technology, limited post-harvest handling infrastructure, including suitable storage, and drying spaces, as well as imperfect transaction processes between value chain actors."</p> <p>"Interventions include improved information and data on post-harvest losses. . . . Investment to enhance market-oriented production and aggregation. . . . Introduction of "land-saving technologies." . . . Research on post-harvest loss reduction. . . . Increased climate resilience and vulnerability management. . . . Agricultural market infrastructure development. . . . Suitable post-harvest handling and storage facilities."^g</p>		

Sources: a. United Nations n.d.a; b. United Nations n.d.b; c. African Union Commission 2015; d. African Union Commission 2014; e. Government of Rwanda 2020; f. Government of Rwanda 2017; g. MINAGRI 2018.

APPENDIX G: NUMBER OF FBOS WITH FLW PROGRAMS BASED ON RELIGIOUS AFFILIATION

FBO TYPES	NUMBER OF FLW PROGRAMS BY RWANDAN FBOS				TOTAL FBOS
	Both (loss and waste)	Food loss	Food waste	No FLW programming	
Association of Pentecostal Churches of Rwanda	0	0	1	23	24
Adventist	1	0	0	6	7
Anglican	0	0	0	6	6
Catholic	0	2	2	22	26
Muslim	0	0	1	20	21
Other Protestants	1	4	1	146	152
Total	2	6	5	223	236

APPENDIX H: ESTIMATED PRODUCTION AND LOSS QUANTITY FOR THE GWIZA RWA34 FARMERS COOPERATIVE

	CHILI PEPPERS	FRENCH BEANS	ONIONS	PINEAPPLES
Land size (area)	13,319	7,592	1,360	370
Quantity harvested (kg)	349,326	480,517	163,354	25,504
Quantity sold (kg)	332,431	473,604	164,436	26,265
Rejected and damaged (sorting losses, kg)	23,394	30,000	0	0
Average price per kg (Rwandan francs)	977	500	420	280

APPENDIX I: COMPOSITION OF THE STRATEGIC ADVISORY GROUP

		N = 18	PERCENT
Institution type	Public institutions	6	33
	FBOs	12	66
Institution role	Organizational leadership (e.g., director)	3	17
	Staff (e.g., policy officer)	3	17
	FBO spiritual	1	6
	FBO leadership (e.g., president)	5	28
	FBO staff (e.g., program manager)	7	39

ABBREVIATIONS

ADRA	Adventist Development and Relief Agency
AEBR	Association des Églises Baptiste au Rwanda (Association of Baptist Churches in Rwanda)
AEE	African Evangelistic Enterprise
FAO	Food and Agriculture Organization of the United Nations
FBO	faith-based organization
FLW	food loss and waste
ICT	information, communication, and technology
JADF	Joint Action Development Forum
KII	key informant interview
NGO	nongovernmental organization
RGB	Rwanda Governance Board
SDG	Sustainable Development Goal
SME	small and medium-size enterprise
UNEP	United Nations Environment Programme

ENDNOTES

1. Key data sources included government policy documents, reports of studies by international organizations, and academic research. Key search terms included food loss; food waste; food security; food behavior; Rwanda; Africa; faith, spirituality, and religion; faith-based organizations; religious communities; and religious values.
2. Sample size was determined using the following linear snowballing method: $n = (z^2[P*q]/d^2), [1]$ which is used to calculate the sample size of quantitative data when the population is unknown. In this formula, n is the sample size, P is the estimated proportion of the study variable or construct based on previous studies or pilot studies (70 percent), $q = 1 - P$ (30 percent), and d is the margin of error (5 percent). In the formula, z is the z-score or a standard normal deviate corresponding to (100 percent, $\alpha/2$ percent), where α refers to the significance level or the probability of making a type I error. The z-score for different significance levels is as follows: 2.58 for 1 percent, 1.96 for 5 percent, and 1.28 for 10 percent.
3. There is continued confusion in the literature about the nature of FBOs in relation to NGOs. Faith-based NGOs can be considered distinct from secular NGOs, but they contain elements of NGOs, such as their global infrastructure, commitment to service, and not-for-profit status (Clarke and Ware 2015).
4. The Political Parties and Civil Society Department is responsible for overseeing FBOs, including coordinating the development of industry strategies and policies and monitoring their implementation. The registration officer for FBOs and political parties is in charge of coordinating, compiling, and consolidating surveillance reports. Aside from coordinating FBO interventions at the district level, the Service Delivery, Good Governance, and Joint Action Development Department also gathers and analyzes data from various programs, projects, and organizations to monitor implementation progress.
5. Some of these organizations include the Adventist Development and Relief Agency, Tearfund, World Relief, World Vision, Rwanda Interfaith Council on Health, Caritas, and Catholic Relief Services.
6. See the Agro-inputs Distribution Strategy of the Alliance for a Green Revolution in Africa to understand the limits of and opportunities for enhancing the accessibility of improved technologies and practices for remote and rural smallholder farmers in Africa (AGRA 2020).
7. The cooperative has a contract with an exporter company that typically prioritizes Grade 1 produce for export, whereas Grades 2 or 3 are often sold to local food businesses, markets, and consumers at lower prices. Markets often demand uniformity in terms of shape, size, and appearance of produce. Therefore, if the cooperative does not maintain consistent quality, it jeopardizes the entire supply chain, leading to rejection.
8. Notably, the question's design may have affected the results because categories were predetermined and respondents could select as many barriers as they wanted. However, this helped to indicate how many barriers were relevant to FBOs.
9. The Circular Food Systems for Rwanda project aims to build a circular economy for food while operating within planetary boundaries. Reducing FLW is one of three principles to catalyze system transformation. Learn more about the program, funding, policies, and more here: <https://circularfoodsystemsrwanda.org/>.

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ABOUT THE WRI FAITH AND SUSTAINABILITY INITIATIVE

WRI Faith and Sustainability believes faith-based organizations (FBOs) have the potential and influence to undertake timely, informed, science-based, and coordinated action that can reduce the impacts of climate change. The initiative envisions a world where FBOs of different faiths proactively work to address WRI's priority areas, which will ultimately contribute to achieving the Sustainable Development Goals, the Paris Climate Agreement, and the reduction of environmental degradation around the world. The team works to provide FBOs with enhanced awareness, guidance, and capacity on how to tackle the urgent global sustainability challenges the world is facing in order to facilitate timely, informed, science-based, and coordinated programs and actions to inform their followers' behaviors and own practices, resulting in reduced environmental degradation and human fragility as well as enhanced prosperity around the world.

ABOUT WRI AFRICA

WRI has been working in Africa for more than 30 years, supporting local partners and African governments to advance forest protection, landscape restoration, and sustainable cities. WRI Africa works toward an inclusive transformation so Africa's people and landscapes flourish. To realize this vision, WRI Africa works with partners to generate actionable knowledge across three strategic pillars: vital landscapes; thriving, resilient cities; and institutional and economic transformation. Through its work on vital landscapes, WRI Africa nurtures productive and resilient landscapes that improve people's livelihoods to help enhance human well-being through food, energy, and water systems that conserve, restore, and sustain the continent's rich natural heritage.



ABOUT THE WRI FOOD PROGRAM

WRI Food works to advance solutions to ensure the world can feed 10 billion people by 2050 while reducing emissions, curbing deforestation, and alleviating poverty. Our research identifies a menu of solutions to the world's food production and consumption problems. Key issue areas for the WRI Food program include prevention and reduction of food loss and waste, sustainable land management, climate-smart agriculture, and addressing the impacts of global dietary trends. WRI Food serves as the secretariat for the Food Loss and Waste Protocol and Champions 12.3, two prominent food loss and waste initiatives.

ABOUT KAICIID INTERCULTURAL DIALOGUE CENTRE

The King Abdullah bin Abdulaziz International Centre for Interreligious and Intercultural Dialogue (KAICIID) is an international organization dedicated to fostering dialogue and understanding among people of different religions and cultures. Founded in 2012, KAICIID works to promote peace, social cohesion, and sustainable development through dialogue-based initiatives. Its activities include facilitating interreligious and intercultural dialogue, promoting religious and cultural diversity, empowering religious leaders and institutions as agents of peace, supporting peace education and research, and engaging in mediation and conflict resolution efforts. KAICIID collaborates with governments, religious leaders, civil society organizations, and educational institutions to build bridges of understanding and cooperation across religious and cultural divides.



ABOUT WRI

World Resources Institute is a global research organization that turns big ideas into action at the nexus of environment, economic opportunity, and human well-being.

Our challenge

Natural resources are at the foundation of economic opportunity and human well-being. But today, we are depleting Earth's resources at rates that are not sustainable, endangering economies and people's lives. People depend on clean water, fertile land, healthy forests, and a stable climate. Livable cities and clean energy are essential for a sustainable planet. We must address these urgent, global challenges this decade.

Our vision

We envision an equitable and prosperous planet driven by the wise management of natural resources. We aspire to create a world where the actions of government, business, and communities combine to eliminate poverty and sustain the natural environment for all people.

Our approach

COUNT IT

We start with data. We conduct independent research and draw on the latest technology to develop new insights and recommendations. Our rigorous analysis identifies risks, unveils opportunities, and informs smart strategies. We focus our efforts on influential and emerging economies where the future of sustainability will be determined.

CHANGE IT

We use our research to influence government policies, business strategies, and civil society action. We test projects with communities, companies, and government agencies to build a strong evidence base. Then, we work with partners to deliver change on the ground that alleviates poverty and strengthens society. We hold ourselves accountable to ensure our outcomes will be bold and enduring.

SCALE IT

We don't think small. Once tested, we work with partners to adopt and expand our efforts regionally and globally. We engage with decision-makers to carry out our ideas and elevate our impact. We measure success through government and business actions that improve people's lives and sustain a healthy environment.



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