

# Food safety priority, a critical gap and a window for effective food, nutrition security and sustainable development in Rwanda-A contextual analysis

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## Abstract

Food safety is globally an important issue and a priority for a sustainable food system and health and essential for achieving several United Nations Sustainable Development Goals (SDGs) outlined in the 2030 agenda. The present study aimed at identifying the critical gaps in the role of food safety in achieving agriculture, food and nutrition security along with the implementation of SDGs in Rwanda. The review of the Rwandan context showed that food safety was not considered and integrated within the development programs for agriculture, food and nutrition security. This lack of food safety integration affected the success of these programs and had a potential negative impact on the achievement of the ten SDGs, namely SDG 1, SDG 2, SDG 3, SDG 5, SDG 6, SDG 8, SDG 11, SDG 12, SDG13 and SDG 17. With available food safety opportunities in Rwanda, food safety should be a priority because it plays a critical role in implementing effective sustainable development programs. There is a need for food safety strategic integration by an evidence-based food safety decision-making approach through involving all concerned stakeholders.

**Keywords:** Food Safety, Agri-food, Nutrition, SDGs, Rwanda

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## 1. Introduction

Food Safety is a global issue and should be a public and socioeconomic priority [40]. The availability of safe food supports several national sectors, including economy, trade and tourism and contributes to food and nutrition security. In contrast, unsafe food poses a global health threat through endangering everyone [38]. Unsafe food creates a vicious cycle of foodborne diseases and malnutrition [38], which result in both disabilities and death [37]. Low-and middle-income countries are more affected by the consumption of unsafe food with an estimated cost of US\$ 110 billion in productivity losses. In Sub-Saharan Africa, foodborne diseases caused the productivity loss equivalent to US\$16. 7 billion [12]. Food safety is a critical factor in achieving sustainable development goals (SDGs) [1, 12, 40] because the costs of unsafe food hamper the sustainable development of affected countries. In many developing countries, food safety has, until recently, received very little policy attention and investment in capabilities, specifically in the area of food risk management [12].

In Rwanda, there has been a progressive development in both agriculture and socio-economic sectors. Rwanda has recorded

several intervention and development programs in agriculture, food and nutrition security [15, 17, 19, 26]. However, food safety and its integral role was not considered when developing the vision for various sustainable development agendas, i.e. the UN sustainable developments goals (SDGs)-2030, the African Union Commission (AU) Agenda 2063 and the East African Community (EAC) Vision 2050 [33]. The present study aimed at showing that food safety is an existing critical gap and a necessary priority for the success of agriculture, food and nutrition security along with the SDGs-2030 in Rwanda.

## 2. Materials and Methods

This study was done by collecting information, via the Google search engine, from online resources published between 2015-2022. The searched key terms were food safety, food and nutrition, and the relation between food safety and food security, nutrition and health, and food safety and SDGs -2030 with a focus on the context of Rwanda. From about 100 consulted online resources, only 42 were relevant and used in this manuscript. The consulted resources helped to identify, in general, the critical role of food safety for food and nutrition security, health and socio-economic development; and in particular, the critical gap and opportunities for food safety and its role in the success of

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the Rwandan agriculture, food and nutrition security programs along with achievement of SDGs-2030 in Rwanda. Based on the analysis, recommendations were formulated for the improving food safety integration in the agri-food and nutrition security agendas for sustainable development in Rwanda.

### 3. Results and Discussion

#### 3.1. *Critical role of food safety for food and nutrition security, health and socio-economic development*

Food safety, nutrition and food security are inextricably linked [38]. Food and nutritional security are realized only when the essential elements of a healthy diet are safe to eat, and when consumers recognize this. Unsafe food creates a vicious cycle of diseases, referred to as foodborne diseases and malnutrition [38]. Almost 1 in 10 people in the world fall ill after eating contaminated food, resulting in a global annual burden of 33 million disability-adjusted life years and 420,000 premature deaths [37]. Foodborne diseases impede socioeconomic development and harm national economies, tourism and trade [38].

The safety of food is vital for the growth and transformation of agriculture, which is needed to feed a growing and more prosperous world population for the modernization of national food systems [12, 31], and for a country's efficient integration into regional and international markets [12]. Food safety must be an enabler and not an inhibitor of global food security [13] and is a prerequisite for market access and commercial success in today's global food system [1]. Without food safety, the world cannot have food security [12].

Food safety underpins sustainable development, it is linked in direct and indirect ways as an integral part of achieving several SDGs, especially those on ending hunger and poverty, on promoting good health and well-being, and those related to socioeconomic development [1, 12, 40]. The SDGs linked to food safety are outlined in table 1.

The above SDGs are likely to be unattainable without adequate, safe and healthy food, particularly for domestic consumers in low and middle-income countries [40]. Without food safety, the world cannot have food security and achieve SDGs [12, 13]. Thus, improving food safety is key in achieving SDGs. Therefore, governments should make food safety a public health priority through developing policies and regulatory frameworks, and establishing and implementing effective food safety systems [38].

#### 3.2. *Food safety as a critical gap in agri-food and nutrition agendas in Rwanda*

Rwanda is a low-income and least-developed country [36], which has registered a progressive economic growth in the last ten years with its highest gross domestic products annual growth of 9.46% in 2019 [34]. In terms of food systems, the Government of Rwanda has demonstrated a willingness to take risks and to innovate by improving nutrition programs, putting in place food safety policies and harnessing the potential of food fortification [33]. However, there have been gaps in policy and

strategic frameworks for addressing food and nutrition security challenges in Rwanda [36]. For about a decade, the policy framework or programs for agriculture, food and nutrition security did not pay attention to food safety; and where it was included, the role of food safety as an integrated part has not been demonstrated or addressed.

Food safety was not integrated into the National Food and Nutrition Policy for 2013-2018 [16]. The agri-food fair trade needs safe food in the concept of "Fair Food, Safe Food" [23]. However, the implementation of the ongoing National Agriculture Transformation Plan (PSTA 4) for 2018-2024 [15] does not demonstrate the food safety role and its integration along the agriculture value chain for the success and markets access of agri-food end-results products. Moreover, that plan does not demonstrate the integrative participation of all agri-food stakeholders (public and private) for the better coordination and tackling the food safety system. As a result, the same consequence, as seen in previous years, will remain - whereby small and micro food enterprises (SMEs) failed to comply with food safety standards for products certification. As a result, only 40% were able to be certified in 2018 [21]. In addition, at the time of writing this paper, contaminated food products are yet to be disposed of and banned from markets [7, 11] due to their poor food safety and potential health risks, which leads to fines and closing down of food businesses. Furthermore, the recent national food safety campaign to inform, countrywide, the public on home-based and market-based food safety does not guarantee the food safety by the developed food safety risk communication strategy and tools material [39].

Regarding the nutrition framework, food safety was not considered in several nutrition programs. The strategic plan (2018-2024) of the National Early Childhood Development Program did not include a food safety component [17]. The implementation of the five years project (2018-2023), funded by the World Bank, for prevention and reduction of stunting [35] did not also consider the food safety issue. Nevertheless, the World Health Organization of the United Nations (WHO) and other studies continue to report a significant burden of foodborne diseases for children less than five years of age in the African region [10, 14, 38]. While not all malnutrition cases can be linked to unsafe food, the consumption of microbial and chemical contaminated foods is a fundamental risk that cannot be overlooked. Foodborne illnesses exacerbate nutrient deficiencies and have huge social and economic costs, particularly in developing countries [41]. As a consequence, the food safety gap in Rwandan nutrition programs may be one of the causes of the persistent malnutrition status with the stunting rate of 33% in children under five years of age [18]. Hunger and undernutrition economically affect Rwanda with an estimated cost of approximately US \$820 million per year [32]. If food safety issue will remain unaddressed in nutrition programs, food will continue to be unhealthy, which will keep causing foodborne diseases and malnutrition in Rwanda. Furthermore, the above contextual gap of food safety in Rwandan agriculture, food and nutrition programs will also affect the achievement of SDGs in Rwanda.

Table 1: United Nations Sustainable Development Goals Linked to Food Safety [12, 40]

Number of SDG	Theme of SDG
SDG 1	No Poverty
SDG 2	Zero Hunger
SDG 3	Good Health and Well-being
SDG 4	Gender Equality
SDG 6	Clean Water and Sanitation
SDG 8	Decent Work and Economic Growth
SDG 11	Sustainable City and Communities
SDG 12	Responsible Consumption and Production Patterns
SDG 17	Global Partnership for Sustainable Development

### 3.3. Negative impact of food safety gap on achievement of SDGs-2030 in Rwanda

The achievement of several SDGs will be affected by the gap of integrated food safety in a country like Rwanda, which has the majority (70%) of the population that depends on the agriculture sector for their economic revenues [6]. The table 2 shows how one affected SDG links to other affected SDGs.

The “No poverty and Zero hunger (SDG 1 and SDG 2, respectively)” will not be achieved in smallholder farmers and small and micro food enterprises (SMEs). As a result, smallholder farmers will incur food losses and/or inaccessible food markets (decrease or loss of income generation) due to the food contamination with food hazards. According to Faour-Klingbeil (2020), food safety plays a critical role in food loss and waste, whereby failure to comply with food safety requirements, along the agri-food value chain, leads to the reduction in edibility and nutritional value of food due to decay, spoilage and loss of the original quality and safety parameters. It can result in recalls or outbreaks of foodborne diseases and enormous food losses when contaminated and spoiled food that is unfit for human consumption is discarded [4]. Consequently, families of smallholder farmers will not have sufficient, nutritious and safe food and the consumption of unsafe food will lead to foodborne diseases and malnutrition that will cost more for medical expenses along with the decrease of farm productivity. Therefore, there will be persistent poverty and hunger. Moreover, the loss of markets access by smallholder farmers will have repercussions on small and micro food enterprises, which will lack sufficient raw materials for processing. At the same time, the non-compliance against food safety standards will lead to the food businesses closures for those food category enterprises, thus leading to the lost or decrease of income generation, then the persistent poverty.

Achieving good health and well-being (SDG 3) will be compromised due to the FBDs burden and persistent poverty and hunger, and result in the failure in SDGs 1 and 2 as explained above. This can be justified by the fact that the majority (70%) of the Rwandan population gets their economic revenues from

agriculture and agri-food value chain activities [6], especially from small-scale farming and small and micro food enterprises activities. If the majority of Rwandans would be affected by persistent hunger and poverty, good health and well-being shall not be granted in Rwanda. Gender equality (SDG 5) will not be achieved considering that women (about 52%) in Rwanda are the key players in agri-food value chains, traditional food chains and household food safety. Without valorizing and integrating food safety along the agri-food value chain, the gender aspect and role, especially women, will not be fully valued provided that the majority (70%) of the population are involved in the agriculture sector and agri-food value chain related activities [6]. Consequently, the SDG 1, SDG 2 and SDG 3 will be compromised.

Clean water and sanitation (SDG 6) will not be achieved if food safety is not integrated along the agri-food chain that values the importance of safe water in the Rwandan context. Considering that the majority (70%) population gets economic revenues from agriculture and agri-food value chain activities [6], it is understood that there is a higher amount of water used along the agri-food value chain (farming, industrial food processing and household food preparation) than other economic sectors in Rwanda. That water needs to be clean and safe, which will automatically improve sanitation for also improved health and well-being (SDG 3) due to the reduction of waterborne diseases, which has an indirect impact on poverty (SDG 1) and hunger (SDG 2) reduction by the participation of women (SDG 5), the majority involved in food production. Therefore, there is a need to integrate food safety along the agri-food value chain, which is referred to as food safety “farm-to-fork” approach.

The decent work and economic growth (SDG 8) would not be realized if the majority (70%) of the Rwandan population, who get economic revenues from agriculture and agri-food value chain activities [6], have been affected by poverty (SDG 1) and hunger (SDG 2) while the health and well-being (SDG 3) is not granted. That could be due to the indirect link with gender (SDG 5) and water and sanitation (SDG 6) issues in agriculture sector that will hamper the economic growth. The sustainable

Table 2: Expected SDGs that will be affected by a gap of food safety implementation in Rwanda

One affected SDG	Linked affected SDGs
SDG 1	SDGs 2, 3,5, 6, 8, 11, 12, 17
SDG 2	SDGs 1, 3, 5, 6, 8, 11, 12, 17
SDG 3	SDGs 1, 2, 5, 6, 8, 11, 12, 17
SDG 5	SDGs 1, 2, 3, 6, 11, 12, 17
SDG 6	SDGs 1, 2, 3, 5, 11, 12, 17
SDG 8	SDGs 1, 2, 3, 11, 12, 17
SDG 11	SDGs 1, 2, 3, 5, 6, 8, 12, 17
SDG 12	SDGs 1, 2, 3, 5, 6, 8, 11, 17
SDG 13	SDGs 1, 2, 3, 5, 6, 8, 11, 12, 14, 15, 17
SDG 17	SDGs 1, 2, 3, 5, 6, 8, 11, 12

city and communities (SDG 11) will be compromised by the recently emerging urbanization rate (17.6%) in Rwanda [42] with the future growth trend. The peri-urban and new urban areas and new community settlements may be dominated by informal or wet food markets along with street food vending that are not yet regulated in terms of food safety in Rwanda. Informal and street food markets were reported to be the main source of foodborne diseases [1] and this will be exacerbated if the gender (SDG 5) role and water sanitation (SDG 6) and hygiene are compromised. Therefore, it can negatively impact good health and well-being (SDG 3). It can also increase poverty (SDG 1) and hunger (SDG 2) due to medical expenses and nutrition deficiency in children along with the decrease in productivity, which indirectly affect the economic growth (SDG 8) of Rwandan community.

The sustainable consumption and production patterns (SDG 12) will not be achieved in Rwanda if there are not responsible stakeholders (producers, processors, retailers, consumers and government, national organizations) to promote social and economic growth (SDG 8) within the carrying capacity of Rwandan ecosystems, among others, the agri-food system. The agriculture and agri-food value chain activities contribute to the social and economic development of 70% of Rwanda's population [6]; and they need sustainability to continue the pace of social and economic development. The sustainable agriculture and agri-food value chain will also need the responsible stakeholders to comply with the emerging requirements (agri-food circular economy, for example) of the food system. Food safety plays an important role in an integrated food system. Moreover, food safety contributes to the agri-food circular economy by ensuring its complementary role in managing food losses and waste [4] that could have a positive impact of hunger (SDG 2) and poverty (SDG 1) reduction. The poverty and hunger reduction could be achieved through promoting gender (SDG 5) and clean water and sanitation (SDG 6) in agri-food and nutrition system of Rwanda, which also could contribute to promoting the health and well-being (SDG3) of Rwandan population.

The climate action (SDG 13) will not be achieved in Rwanda if food safety, as a policy, is not considered and integrated among other national policies, strategies and planning (target 13.2) used to integrate climate change measures [30]. While agriculture is the important economic sector for the majority (70%) of Rwandans [6], this sector, however, contributes to global warming by greenhouse gas (GHG) emissions through two aspects related to food safety management. The two aspects are Nitrogen fertilizer when it is over used [2, 27], and food losses and waste, which is considered to be the third global contributor to annual GHG emissions [9, 34]. While over Nitrogen fertilization causes water pollution with endangering aquatic ecosystem [2], food hazards contamination makes food unfit for human consumption, leading to food losses and waste along the food supply chain [4, 29].

The recent report shows that Rwanda loses and wastes 40% of total food production each year [34] and approximately 2,075,405 tonnes of food is wasted at household level per year. In addition, 18.7 per cent of the country's households are food insecure [20] and food losses and waste represent 21% of its total land use, 16% of its greenhouse gas emissions, and a 12% loss to Rwanda's annual GDP [34]. Knowing that Rwanda currently has Malabo declaration treaty commitments with nationally determined contribution (NDC) actions to reduce food loss and waste [34] for reducing GHG emissions, this will not be achievable if food safety is not integrated along the food commodities chain. Therefore, the approach, for Rwanda, would be to integrate an appropriate and improved food safety policy into other policies along the agri-food value chain. This could prevent food from contamination from all target hazards, and over usage of Nitrogen fertilizer in order to reduce GHG emissions as an action to climate change (SDG 13). That approach will contribute to reducing poverty (SDG1) and hunger (SDG 2); achieving good health and well-being (SDG 3), gender (SDG 5), water and sanitation (SDG 6), social and economic growth (SDG 8), sustainable city and communities (SDG 11), sustainable production and consumption by halving food waste (SDG

12.3), life below water, life on land (SDG 15); and attaining the global partnership for sustainable development (SDG 17).

The global partnership for sustainable development (SDG 17) will not be achieved in Rwanda if food safety is not considered and integrated with the agriculture and agri-food value chain activities, which involve the majority of the population for their economic revenues [6]. The lack of integrated food safety in Rwanda will hinder the vital need for multi-stakeholder collaboration to collectively build more inclusive, resilient and sustainable societies from the global perspective [40]. Food export from Rwanda could play a big role to allow the country to enter global food markets with an opportunity of global partnership for the improved and sustainable agriculture sector. However, the success in that partnership needs the production of food products that comply with markets or partners' requirements for fair food trade. The fair food trade must be based on "fair food, safe food concept" [22] that necessarily relies on food safety system with a need of women (SDG5) role and the improved clean water and sanitation (SDG 6) in the Rwandan agri-food and nutrition system. As a result, that will contribute to the poverty (SDG 1) and hunger (SDG 2) reduction along with improving the health and well-being (SDG 3), social and economic growth (SDG 8), sustainable production and consumption (SDG 12), and eventually the sustainable city and communities (SDG 11) in Rwanda.

#### 4. Food safety opportunities for effective agri-food policy framework and sustainable development in Rwanda

Although gaps of food safety integration exist in Rwanda, there are several advantageous and potential opportunities, which can be exploited and prove beneficial. Rwanda has three public agencies whose functions, among others, are related to either food safety regulation or implementation and enforcement [23, 24, 25]. They are the Rwanda Standards Board (RSB), Rwanda Food and Drugs Authority (Rwanda FDA), and Rwanda Inspectorate, Competition and Consumer Protection Authority (RICA). Moreover, Rwanda is a signatory member of several regional and international communities whose agendas and agreements include food safety as an important element to improve national food systems and socio-economic development. There is a recently created legal framework of harmonized and common Sanitary and Phytosanitary (SPS) standards among partner States of the East African Community (EAC) [3]. The existing African partnership through the Malabo declaration for improving the national food control systems by the integration of food safety into agricultural development [8]. The newly ratified African Continental Free Trade Agreement (AfCFTA) that comprises the component of the harmonized SPS regulations with a policy framework adopted by the African Union whose foundation is science-based food safety standards [8].

In addition, international organizations are there to support countries in the process of food safety improvement. The United States Department of Agriculture, through the Venture 37, implements funded programs in the region that put food safety and quality at the core to support adoption of food safety risk-based procedures and putting the consumer first [28]. The support

by WHO through its ongoing "Global Strategy for Food Safety 2022-2030" for all countries to achieve safe and healthy food for all. The WHO is assisting countries in providing and fostering food safety leadership and policy dialogue; establishing food safety normative guidance; enhancing technical cooperation and building stronger capacity; and building partnership and fostering global partnership [40]. Furthermore, the Food and Agriculture Organization (FAO) supports governments to strengthen the system of food control and surveillance, in accordance with international law and best practices [5]. The Codex Alimentarius Commission (CAC) and the International Food Safety Authorities Network (INFOSAN), established by FAO and WHO, are there to assist Member States in establishing food standards and managing food safety risks [41]. Therefore, benefiting from above opportunities would help Rwanda to integrate effectively food safety in its agri-food policy framework with an impact of improved agriculture, food and nutrition security along with socio-economic development.

#### 5. Conclusion

Rwanda has initiated different programs for agriculture development, food and nutrition security. Nevertheless, their objectives will not be effectively reached without the consideration and integration of food safety. Food safety gap is critical in the Rwandan development context because it will not only affect food security, nutrition and food businesses, but also the socio-economic development towards more than half of the SDGs for 2030 agenda. Food safety is a necessary priority in Rwanda, and envisioning sustainable development agendas should proceed with prioritized food safety as an integral part. Rwanda needs to improve its food safety system, which will target to alleviate all kind of burdens from unsafe food. The strategic approach will be to involve all actors and stakeholders at all levels of agri-food value chains with consideration of the Rwandan socio-economical context, which will allow the forward-looking food safety governance founded on evidence-based decision-making policy framework in agriculture, food and nutrition and health agendas with regard to the SDGs-2030. The implementation is possible since Rwanda has several food safety opportunities to benefit from at national, regional and international levels.

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