



ASSESSMENT OF COMPLIANCE AND ASSOCIATED FACTORS OF FOOD POLICY IMPLEMENTATION IN GASABO DISTRICT.

By Mr. MUHIRWA Parfait S. M Supervised by Dr. RUTAYISIRE
Erigine, Dr. MATSIKO Eric and Mr Didier Yves Umwungerimwiza

In this book, the author investigates the challenges and barriers hindering the successful implementation of food policies. The book examines the complex factors that impede the translation of food policies into tangible outcomes. The abstracted work critically analyzes the political, economic, social, and institutional barriers that may undermine effective policy implementation. By delving into the intricacies of the food system, the book uncovers the underlying causes of these barriers and offers insights into potential strategies and solutions for overcoming them. Through a comprehensive exploration of the subject, the book aims to provide policymakers, owners as practitioners of food industries, and researchers with valuable knowledge and recommendations to enhance the effectiveness and positively impact food industries towards public health protection.

June, 2023

Declaration

I, MUHIRWA SHIMWA Parfait Marcel, declare that this book, titled " ASSESSMENT OF COMPLIANCE AND ASSOCIATED FACTORS OF FOOD POLICY IMPLEMENTATION IN GASABO DISTRICT." is entirely my own work unless otherwise indicated and acknowledged.

I hereby acknowledge and declare the following:

1. Any material or ideas obtained from other sources, including books, articles, websites, and other written or oral sources, have been properly cited and referenced using the Mendeley Desktop 1.19.8
2. Any assistance, whether intellectual, financial, or technical, received during this research and publication writing has been duly acknowledged in the acknowledgements section of this publication.
3. Any contributions made by others to this research or the writing of this publication are fully acknowledged in the acknowledgements section.
4. No part of this publication has been previously submitted for any degree or qualification at this or any other university or institution of my knowledge. Thus this work has not been concurrently submitted to any other institution for examination or publication.

I understand that any failure to acknowledge the above points may result in disciplinary actions.

MUHIRWA SHIMWA Parfait Marcel

Dedication

I dedicate this book to:

My Family (My Wife, My Son, My Parents, My Siblings, etc.): For their unwavering love, support, and encouragement throughout my academic endeavors. Your sacrifices have made this possible.

My Advisor: NKUNDIZANYE Dorothee, GIRAMATA Claire, BUREZI Eugene, MANGU Billy, and IRADUKUNDA Olive - Thank you for your guidance, expertise, and patience. Your mentorship has been invaluable to me.

My Friends including but not limited to BAHATI Evariste, MUCUNGUZI Desire and MPH Classmates including but not limited to; NDAYISABA Cleophas, NIYITEGEKA Jean Pierre, MUSABYIMANA Francine, MUHAWENAMAHORO Vestine, KALEMA Moses, MVUYEKURE Leonidas as well as people from Sports Arena and More Than Friends Groups: For the countless hours of study sessions, moral support, and laughter that helped me maintain my sanity during this journey.

Special thanks to NSHUTI Seth Benjamin, BIRORI Espoir, SINDAYIGAYA Clement, IBINGIRA Richard, NDAYIRAGIJE Gael, RWAKANA Jasper, KAYITESI Gisele, NYIRAMBYEYI Agathe, UWIZEYIMANA Anathalie, MUTIMUKEYE Nicole, HABİYAREMYE Theobald, NYIRIMIGABO Eric, BAZIRUTEBYE Jean Pierre, NDAYISENGA Balthazar, MUSANGWA Desire, NSHIMIYIMANA Jean Aime, MUNYENSANGA Celestin, MANZI Justin, NYAMWASA Innocent, Francois Xavier Sunday, BIZIMANA Ernest and NISHIMWE Console: For support and inspiration. Your contribution has been a driving force behind this publication.

Rwanda FDA's colleagues: For ensuring a conducive environment throughout all of this journey, the role you have played is so significant in my academic career.

Your unwavering support and belief in me have been instrumental in achieving this milestone. Thank you for being a part of this achievement.

MUHIRWA SHIMWA Parfait Marcel

Acknowledgement

I would like to extend my heartfelt gratitude to the following individuals and organizations for their invaluable contributions and unwavering support in the creation of this book:

My Research Collaborators: I extend my appreciation to the dedicated individuals and my academic lecturers who collaborated with me on the research that underpins this book.

My Respondents during data collection: Rwanda FDA personnel, Rwanda Standards Board staff, Rwanda Development Board staff, Hotels' personnel as well as Food Industry practitioners including the owners and their respective responsible technicians

Rwandan Government headed by His Excellence Paul Kagame, for his significant role in the food industry, tireless efforts ensuring the safety, quality, and sustainability of the food sector as well as his continuous support in promoting the well-being of the citizens of Rwanda in a wide range of responsibilities and initiatives.

Entire Scientific Community and Non-Government Organizations that can utilize the findings of my research.

Your insights and expertise have enriched the content of the research and strengthened its foundation.

Abstract

Background:

It is widely known that the unregulated food sector may result in chaotic manufacturing, unjust preparation and substandardized food products that can lead to short and long-term adverse health effects ranging from infectious diseases to chronic diseases

Objective:

This research has aimed to determine the extent to which food businesses comply with current food regulations and identify the factors that influence food policy compliance among food businesses.

Method:

A mixed method study design was used to determine the extent to which the food businesses comply with available food policies in GASABO District from June to September 2023. A total of 403 respondents participated in this study whereas 30 participated through focus group discussions.

Results:

The following factors were significant to complying with available food policies: being a male food sector practitioner (AOR 5.5; CI 1.79 - 16.87), manufactured food product category being a low risk food product (AOR 2.83; CI 1.64 - 12.59), calibration of food manufacturing equipment (AOR 1,32; CI 4.36 - 16.87), access to adequate awareness on available food policies (AOR 14.1; CI 2.71 - 73.22), complete cross contamination prevention measures (AOR 5.78; CI 1.72 - 19.49), and having a responsible technician (AOR 0.61; CI 0.13 - 2.97).

The extent to which food businesses comply with available food policies was found to be 89.08% whereas food policy implementation was attributed to stakeholders' engagement in designing policies.

Conclusion:

The study concluded that food manufacturers who comply with available food policies are those who manufacture low risk food products, those who have employees who are trained and certified on food safety related themes and those who follow complete cross-contamination prevention measures.

Recommendations:

This study recommended supporting female food sector practitioners in compliance with food policy through trainings. It again recommends strict adherence through enforcement inspections to both high and low risk food product manufacturers. Again, this study recommends regular calibration of food manufacturing machines to ensure consistency, accuracy, and safety in the food industry.

Table of contents

Declaration	2
Dedication	3
Acknowledgement.....	4
Abstract	5
Table of contents	6
List of tables	8
List of Figures	9
List of acronyms and abbreviations	10
Definition of key terms	11
CHAPTER 1. INTRODUCTION	Error! Bookmark not defined.
1.1 Background	Error! Bookmark not defined.
1.2 Problem statement.....	14
1.3 Study objectives	15
1.4 Research questions	15
1.5 Scope.....	15
CHAPTER 2: LITERATURE REVIEW	16
2.1 Theoretical literature review	16
2.2 Empirical literature review according to the specific objectives	19
CHAPTER 3. METHODOLOGY	22
3.1 Research Design.....	22
3.2 Study setting	22
3.3 Study population	22
3.3.1 Inclusion Criteria.....	23
3.3.2 Exclusion criteria.....	23
3.4 Sample size.....	23
3.5 Sampling technique	24

3.6 Data collection method.....	24
3.7. Variables.....	25
3.8 Data analysis procedures.....	28
3.9 Ethical considerations	29
CHAPTER 4: RESULTS	31
CHAPTER 6: DISCUSSION OF THE RESULTS.....	58
CHAPTER 7: CONCLUSION AND RECOMMENDATIONS.....	62
6.1 Conclusion.....	62
6.2 Recommendations	62
7. REFERENCES.....	64

List of tables

Table 1: Illustration of the study’s respondents with respect to their area of operations; 24

Table 2: Univariate analysis of Sociodemographic, Food Policy understanding & awareness and Products’ Characteristics. 32

Table 3: Univariate analysis of food policy adoption and stakeholders’ shared responsibility towards food policy. 35

Table 4: Univariate analysis of challenges associated compliance to available policies in food industry. 37

Table 5: Bivariate analysis of factors associated to compliance with available food policies.... 38

Table 6: Bivariate analysis for Sociodemographic, Food Policy understanding & awareness and Products’ Characteristics. 44

Table 7: Bivariate analysis for food policy adoption and stakeholders’ shared responsibility towards food policy. 47

Table 8: Bivariate analysis for challenges associated compliance to available policies in food industry. 50

Table 9: Multivariate analysis of the outcome and significantly related variables..... 51

List of Figures

Figure 1: Conceptual framework of compliance and associated factors of food policy implementation in Gasabo district. 21

Figure 2: Geographical representation of GASABO District**Error! Bookmark not defined.**

List of acronyms and abbreviations

GHP: Good Hygiene Practices

GMP: Good Manufacturing Practices

HACCP: Hazard Analysis and Critical Control Points

BBAB: Banana Based Alcoholic Beverages

SOPs: Standard Operating Procedures

Rwanda FDA: Rwanda Food and Drugs Authority

MINAGRI: Ministry of Agriculture and Animal Resources

MINICOM: Ministry of Trade and Industry

PSF: Private Sector Federation

RAB: Rwanda Agriculture Board

RDB: Rwanda Development Board

RSB: Rwanda Standards Board

RICA: Rwanda Inspectorate, Competition and Consumer Protection Authority

S-Mark: Standardization Mark

WHO: World Health Organization

FBDs: Foodborne diseases

ADECOR: Rwanda Consumer's Rights Protection Organization

NGOs: Non-Governmental Organizations

RHA: Rwanda Hospitality Association

RAM: Rwanda Association of Manufacturers

RCA: Rwanda Cooperative Agency

Definition of key terms

Food Industry: The food industry comprises a complex network of activities related to the supply, consumption, and catering of food products (1).

Food policy: Food policy is the area of public policy concerning how food is produced, processed, distributed, and purchased (2).

Responsible technicians: These are food technologists who are responsible for the safe and efficient development, modification, processing, manufacture and distribution of food products (3).

Disability-adjusted life years (DALYs): One DALY represents the loss of the equivalent of one year of full health (4).

Food regulators: These are governmental institutions or international organizations responsible for ensuring the safety and quality of food products consumed by the public. (5)

Public health protection: These are the measures and actions taken to safeguard the health and well-being of communities and populations(6)

High risk food: Food products with a great potential to cause foodborne illnesses due to their inherent characteristics, the way they are processed, prepared, or handled (i.e. milk, meat, etc.) (7)

Low risk food products: These are food products with a lower likelihood of causing foodborne illnesses due to factors such as their inherent characteristics, and processing methods. They are generally considered safer to consume without extensive cooking or special handling precautions (7)

Premise licensing: A mandatory process of obtaining a license/permit prior to start/open/run/operate a food establishment after examining the processing facility, personnel & equipment that ensures the product's quality and safety(8)

Good Manufacturing Practices: This is a set of guidelines and standards that ensure the Premise, Personnel, Products and Procedures are safe and consistent when handling food products from raw material sourcing to the finished product reaching consumers.(9)

Product registration: This is a process of obtaining official approval from regulatory authorities to market and sell a food product. Its goal is to ensure that the food product meets safety, quality, and labeling standards, and is fit for consumption by the public prior to being placed on the market. (10)

Hazard Analysis and Critical Control Points: this is a systematic approach used to identify, assess, and manage potential food safety hazards in food production, processing, and distribution. (11)

Good Hygiene Practices: These are essential routines aimed at maintaining cleanliness, preventing contamination, and promoting safe and hygienic conditions in food production. (12)

Standard Operating Procedures: are documented guidelines and instructions that outline the steps, processes, and best practices to be followed for specific tasks or activities within an organization. (13)

CHAPTER 1. INTRODUCTION

1.1 Background

Every year, an estimated 600 million individuals, about one in every ten people in the globe; fall sick after eating contaminated food, and 420 000 die, resulting in the loss of 33 million healthy life years (DALYs). Each year, low and middle-income countries lose up to US\$ 110 billion in productivity and medical costs as a result of hazardous food. Children under the age of five account for 40% of the foodborne disease burden, with 125,000 deaths per year. (17) WHO launched its food safety strategy for 2022 to 2030 to reduce foodborne diseases. The plan sets a target on the burden of foodborne illness with a 40 per cent reduction by 2030. (30)

This is among the findings of WHO's "Estimates of the global burden of foodborne diseases" – the most comprehensive report to date on the impact of contaminated food on health and well-being. (30) In terms of Compliance level; 50% of foodborne illness has been associated with improper storage or reheating and 39% are due to cross-contamination. Since foodborne illnesses are due to unhygienic preparation and lack of adequate food production knowledge (32).

In Africa, 91 million people fall ill and 137,000 die each year from foodborne illnesses. In the Western Pacific-China, Australia, and the Pacific islands 125 million fall ill and 50,000 die from foodborne diseases. Aflatoxin is the leading cause of illness, and more than 10,000 residents develop liver cancer every year from its aftereffects. (31)

People living in developing countries where most food industry and food policymakers are not extremely harmonized; are more likely to be exposed to unhealthy environments through poor access to clean water to adequately wash food items, unsafe transportation and/or inadequate storage of foods, compromised immune responses to foodborne infections, insufficient knowledge of safe food processing and handling practices, FBDs are not prioritized in public health prevention and care, particularly in underdeveloped nations. In general, the countries with the greatest rates have the fewest resources to combat them. (19)

The establishment of Rwanda FDA in 2018 aimed at addressing the safety issues as per its mandate to protect public health through regulation of processed food, among others. When the Authority took over the sector in April 2019, there was no data on how the industries were performing in terms of compliance with safety requirements. (21)

Food policy makers have adopted several preliminary strategies for ensuring food safety in the food industry through operation license provisions for tourism entities given by Rwanda Development Board (RDB), Food standards development and Standardization marks (S-Mark) given by Rwanda Standards Board (RSB), premise license and product registration given by Rwanda Food Drugs Authority (Rwanda FDA). RSB, RDB and Rwanda FDA as food sector regulatory institutions in Rwanda have a significant and interconnected relationship toward public health protection by policy-making institutions including government officials, legislators, and regulatory agencies, play a crucial role in creating, implementing, and enforcing policies and regulations that govern the food industry. Meanwhile, the food industry, which encompasses various businesses and organizations involved in food production, processing, distribution, and retail, is directly affected by these policies and regulations. (19)(20)

The government of Rwanda has been making efforts to improve food safety standards and ensure the quality of food products within its food industry. The country also has made significant efforts to strengthen its food safety policies and regulations to ensure the safety and quality of food products. The government, through various institutions, has established agencies to govern food safety practices and protect public health through the Rwanda Food and Drugs Authority (Rwanda FDA), other relevant institutions like Rwanda Development Board (RDB) and Rwanda Standards Board (RSB) which have established regulations and implemented measures to enhance food safety practices and protect public health through versatile regulatory frameworks like market surveillance, inspection monitoring, food safety standards and guidelines. (21) (22) (23) Gasabo district is a typical example of where all food processing firms are either licensed or in line with fulfilling the requirements set by food industry regulatory bodies although 100% strict adherence to food policy remains critically unimplemented with low-capacity resources being frequently mentioned.

A low-income and underdeveloped nation, Rwanda has had economic growth during the past 10 years, reaching its greatest GNP annual growth of 9.46% in 2019. In terms of food systems, the Rwandan government has shown a willingness to innovate and take risks by enhancing nutrition programs, implementing food safety regulations, and maximizing the potential of food fortification. The conceptual and policy frameworks for tackling Rwanda's problems with food and nutrition security, however, contain inadequacies. Food safety has received little attention from policy frameworks or programs for agriculture, food, and nutrition security for the past ten years, and where it has, its importance as an integrated component has not been proven or addressed. (24)

1.2 Problem statement

Food-borne diseases impede socioeconomic development by straining health care systems, impairing productivity and harming national economies, tourism and trade. Recent estimates indicate that the impact of unsafe food costs low- and middle-income economies around \$95 billion in lost productivity each year. (18) In the absence of well-defined and effective food policies, several negative consequences can occur, impacting both individuals and society as a whole. (25)

Food insecurity may arise in the absence of well formulated food policies, vulnerable populations, such as low-income individuals and families, may struggle to access nutritious and affordable food. This can lead to food insecurity, where people do not have consistent access to enough nutritious food to maintain a healthy life. Also in the absence of policies that promote healthy eating and food labeling, people may consume diets that lack essential nutrients, leading to malnutrition and various diet-related health problems, including obesity, diabetes, and heart disease. (26)

Arising of foodborne illnesses due to the lack of regulations and oversight in the food industry can result in unsafe food production and distribution, increasing the risk of foodborne illnesses and outbreaks so as environmental degradation due to the lack of food policies that address sustainable agricultural and food production practices resulting in overuse of natural resources, pollution, deforestation, and other activities that harm the environment. (44)

Economic disparities caused by the absence of food policies can exacerbate economic inequalities, with large corporations benefiting while small-scale farmers and local food systems suffer. This can also affect rural communities and small businesses as well as inadequate labor regulations which can result in exploitation and poor working conditions for farm and food industry workers. (33)

Most of global food trade issues of food products are subjected to disastrous food manufacturing practices resulted from the absence of strict regulations that can lead into food fraud conditions where products are mislabeled or adulterated, deceiving consumers and compromising food quality and safety which can lead to food waste due to massive amounts of edible food being discarded, which has economic, environmental, and ethical implications. (34)

Individuals may not receive adequate information to make informed dietary choices, which can lead to health issues where Indigenous and traditional food systems are threatened because of gaps in food policies that protects cultural heritage, food diversity, lack of dietary guidance, nutritional guidelines and sustainable education related to food production and/or distribution. (35)

It is very important to comply with designated food policies that ensure public health protection through food safety improvement that grants the prevention of infectious and chronic diseases like diarrhea, and cancers that are linked to the consumption of sub-standardized/contaminated food products and this may endanger the sector's reputation, harming food business related to food manufacturing, importation and/or distribution. (17)

To mitigate these potential consequences, it is important for governments to establish comprehensive food policies that promote food safety, security, sustainability, and public health. These policies should be evidence-based, culturally sensitive, and address the specific needs of each region or country. (30)

1.3 Study objectives

The main objective of this study is to determine the extent to which the food businesses comply with available food policies in GASABO District.

The following are the specific objectives;

- ✓ To assess the compliance level of the food industry toward existing food policies.
- ✓ To investigate stakeholders' engagement toward food policy making and implementation
- ✓ To identify the factors associated with compliance to available policies in food industry.
- ✓ To evaluate the challenges associated compliance to available policies in food industry.

1.4 Research questions

What are the extent, compliance level, stakeholders' engagement and factors associated to compliance with available food policies in GASABO District?

1.5 Scope

The study aimed to determine the magnitude of complying with available food policies among food businesses in GASABO District, one out of three districts of Kigali City, the capital of Rwanda. Where food industry sector encompasses various sectors such as restaurants, fast food chains and street vendors, grocery stores, food manufacturers, tourism entities etc., whereas food policies include government regulations, and food standards. But in order to ensure a clear and focused study by narrowing down the sector, the boundaries of this study rely on Good Manufacturing Practices through its four pillars (Premise, personnel, Products and Procedures). Questionnaire and focus group discussions of key informants were the methods that facilitated in exploring the relevance of food policy implementation for sustained public health.

CHAPTER 2: LITERATURE REVIEW

2.1 Theoretical literature review

The relevant literature was organized thematically, addressing compliance level of the food industry toward existing food policies, stakeholders' engagement toward food policy formulation and implementation and factors associated with compliance to available policies in food industry. The food sector is composed of the food industry which is involved in the production, processing, packaging, distribution, and sale of food products. (14) The food sector around the world is determined and shaped by food policies that have significant impact on the safety, nutrition, and accessibility of food for consumers, as well as the economic viability of the food sector. (15) (16)

2.1.1 Literature review on compliance level of the food industry toward existing food policies.

Meaningful food safety compliance requires good alignment between regulatory design and desired outcomes. A key question for a policymaker intent on establishing a regulatory regime is “How much compliance will it need?”. This issue of how much compliance is needed to deliver the regulatory objectives is a challenge. While there is a solid body of literature on modern food law, there is less research done specifically on food regulation compliance. Recent research has shown the complexity of enforcement and “regulatory delivery” systems in food, but the link between such enforcement systems and actual compliance is far from simple. Effective food safety compliance requires a complex set of factors, good regulation, well-designed enforcement and, possibly most importantly, competence, knowledge, and understanding of food safety’s importance on the side of food business operators. (36)

A study that focused on level of compliance of food handlers with national regulations on food hygiene and safety practices in Thohoyandou, South Africa revealed that complying with available food safety policies is becoming a key public health priority because a large number of people consume their meals outside their homes. As a result, they are exposed to food borne illnesses that originate from food stalls, restaurants and other food outlets. (37)

A study by Romain E, et al. Propose and test a model of food policy acceptability. The model was structured in four levels: government, topic, policy, and individual. In this study, they focus on two levels that are actionable for policy-makers: the topic and policy levels. Their study suggested that three factors have a positive effect on acceptability at the topic level: awareness of the issue, the legitimacy of state intervention, and social norms.

At the policy level, they reported a positive effect of the policy's expected effectiveness, it's appropriate targeting of consumers, and the perceived support of the majority. On the other hand, more coercive interventions and those generating inequalities are judged to be less acceptable levels. Additionally, they reported an interaction between awareness and coerciveness on acceptability levels toward food policy compliance. Participants who were aware of the issue were more likely to support coercive policies. they also find evidence for a trade-off between coerciveness, effectiveness, and acceptability, as more coercive measures are considered more effective, but less acceptable by food businesses. their findings offer policy-makers, food & nutrition experts, and advocates for healthier integrated understanding of the underlying factors that determine food policy compliance levels. (38)

2.1.4 Literature review on stakeholders' engagement toward food policy formulation and implementation.

Stakeholders play crucial roles in both the formulation and implementation of food policies. Food producers, manufacturers, and distributors do provide valuable insights into the practicalities and challenges of implementing policies by offering industry-specific expertise and helping identify potential barriers to compliance. These individuals and groups with vested interests or influence in the food industry and related areas contribute in various ways to shaping, supporting, and ensuring the success of food policies. (39)

Consumer advocacy groups and watchdog organizations play a crucial role in raising awareness about food-related issues, advocate for policies that protect consumers, and mobilize public support for healthier and safer food choices. (40) Again private or governmental health professionals like nutritionists, lecturers, dietitians, and healthcare providers do contribute their expertise helping to shape policies that protect public health by reducing diet-related diseases. (41) Also the media plays a significant role in both food policy formulation and implementation by shaping public perceptions, disseminating information, and holding stakeholders accountable. (42)

2.1.3 Literature review on factors associated with compliance to available policies in food industry.

Understanding the factors associated with compliance is essential for improving regulatory effectiveness and ensuring the safety and quality of food products through;

Regulatory framework and enforcement: The strength and consistency of food regulations and the enforcement mechanisms in place significantly impact compliance. Strict enforcement with clear penalties for non-compliance can be a powerful incentive for businesses to follow the rules. (43)

Perceived benefits versus cost of non-compliance: Businesses are more likely to comply when they perceive benefits in doing so, such as improved reputation, reduced liability, and increased consumer trust. Whereas compliance can also open doors to new markets, potential costs of non-compliance including fines, legal actions, and damage to the brand's reputation, are strong drivers for adhering to food policies. (44)

Information, training and awareness: Key factors in increasing consumer and producer awareness regarding available food safety policies and access to training and information ensure that well-informed employees and management are more likely to implement policies correctly. (45)

Technological adoption and advancements: Quality control systems, traceability, and food safety management software and machineries can help companies better adhere to regulations in terms of food safety consistency. (69) Companies that establish internal controls like putting in place a mechanism of acceptance and rejection criteria by monitoring their own compliance tend to have better overall compliance rates. (74)

The culture and norms within the industry can influence compliance. In some sectors, there may be a culture of rigorous adherence to regulations, while in others, cutting corners may be more accepted. (70) Adequate resources, including financial, human, and technical resources, are necessary to meet food policy requirements. Smaller businesses may struggle with compliance due to resource constraints. (71)

Many businesses seek third-party certifications like ISO standards or organic certifications to demonstrate their compliance with specific policies. These certifications can enhance credibility or awards for companies that excel in available food policies. (72) The political climate and legal environment can impact food policy compliance. Changes in government, new policies, or lawsuits can lead to shifts in compliance behavior. (73)

2.2 Empirical literature review according to the specific objectives

The study's framework conceptualizes foundations for understanding the factors, relationships, and aspects that were found relevant to the study's objectives through organizing thoughts that guided this research as follows;

- ✓ **To assess the compliance level of the food industry toward existing food policies.**

Sociodemographic characteristics in most studies showed that risk perception including food safety where women were found to be more sensitive to risk than men were and that the work experience as well as cultural consideration play key roles on compliance level of food manufacturers toward available food policies. (75)

Products' Characteristics which include product category, ensuring food safety and quality and the use of standard operating procedures revealed that clear rules always produced the outcomes they aimed at, and even when outcomes were achieved overall, it was not far from certain that necessarily complying with food rules made the food safer and meaningful food safety compliance required good alignment between regulatory designed and desired outcomes. (76)

Food Policy understanding & awareness is highly encouraged as the use, reproduction and dissemination of material related to food safety compliance, product information as well as safe handling practices. Except where otherwise indicated, material shall be copied, downloaded and printed for different studies, research and teaching purposes, or for use in commercial and/or non-commercial products or services. (45)

- ✓ **To investigate stakeholders' engagement toward food policy making and implementation.**

Food Policy Adoption among governmental and other important actors had played important role in creating healthy public policies and supportive environments that facilitated access to safe, affordable, nutritious food whereas lack of education and knowledge was one of the reasons behind food handlers' non-adherence to food safety and hygiene practices. The findings also revealed that training should be a requirement for food handlers in order to prevent foodborne diseases and reduce pathogen spread (cross contamination) during food preparation. (77)

Stakeholders' shared responsibility towards Food Policy was ranked as crucial aspect of developing and implementing effective food policies. additionally, consumer trust in a food industry self-regulation system depends on the level of government support. The need for education and training of food handlers in food safety needs to be emphasized on account of epidemiological evidence around. (78) (79)

Food Policy Adherence is professionally important formation of qualities and professional thinking of food technicians also known as food technologist necessary for work in modern food production by demonstrating their practical ability for the sector. Government policies promoting healthier food environments contributed to healthier diets and prevent diet-related non-communicable diseases. (80)

✓ **To identify the factors associated with compliance to available policies in food industry.**

Food Safety Measures concerns arise with food manufacturing, there are legal and ethical responsibility to mitigate any damage related to the health and wellbeing of consumers through products' recalls. Also calibration of equipment helped in limiting transfer of harmful microorganisms (bacteria, viruses, or parasites) from one surface or food item to another and this transfer can occur during food preparation, handling, or storage and is a significant cause of foodborne illnesses. (81)

Food Policy Adoption had been seen in regular acceptance and rejection criterion for both of raw materials and finished food products and as established standards and guidelines used by the food industry to determine whether a food product and their respective raw materials met the required quality, safety, and regulatory standards. (82)

Food Policy Challenges is linked to safe food supplies, national economies and global trade, effective and predictable food policies that facilitated private sector growth, investment and ensured local ownership by governments, private sector businesses, and consumers. However, food safety problems and challenges were not limited to one geographic, education, economic, political or social that kept threatening the sector. (83) (84)

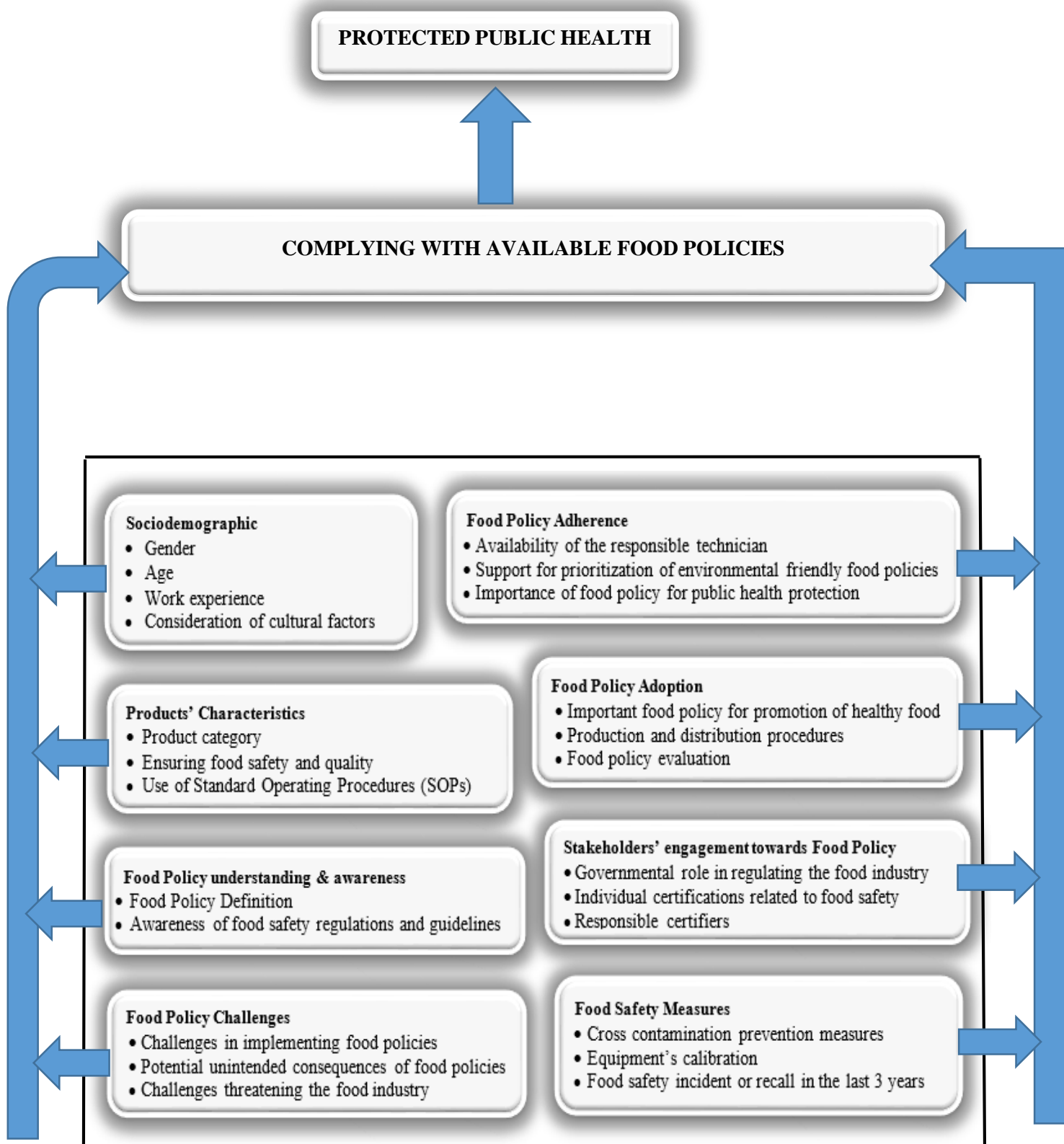


Figure 1: Conceptual framework of compliance and associated factors of food policy implementation in Gasabo district.

CHAPTER 3. METHODOLOGY

3.1 Research Design

This is a mixed method (Quantitative and Qualitative) research design that assesses food policy implementation among food industry owners towards public health protection. The quantitative method was used to assess the level of compliance with food policy and associated factors through numerical data gathered by an illustrated questionnaire, while the qualitative method was used to assess the challenges and gaps in policy implementation through a collection and in-depth analysis of non-numerical data in audio form because some issues can't be answered by numerical responses but comprehensive insights.

3.2 Study setting

Hotels are expected to comply with available food policies and RDB is a food regulatory institution, it is the main food policy maker institution in the Tourism sector where hotels as our study subjects belong and a lot of food items are prepared in hotels. According to the RDB tourism regulation division, there are 208 accredited tourism entities in Gasabo District out of 503 in Kigali City and that means that almost half of the tourism entities in 3 districts of Kigali city are located in GASABO district. Rwanda FDA's mapping report also revealed that GASABO District is the most industrialized district of Rwanda housing over 79 out of 145 food manufacturers located in Kigali city, owning great industries in the industrial zone known as Kigali Special Economic Zone (KSEZ) and 2 out of 3 regulatory institutions (Rwanda FDA & RDB) thus proving GASABO District to be the suitable choice for this research study.

3.3 Study population

Population of Interest in this study are personnel in the food industry and food policy formulation institutions.

Personnel in the food industry sector participated in quantitative data collection and those are the people working in food processing facilities mainly limited to owners, responsible technicians, managers, supervisors, waiters and waitresses in hotels.

Personnel in the sector of food policy formulation participated in qualitative data collection and those are the people working in food policy formulation institutions like the Rwanda Food and Drugs Authority (Rwanda FDA), Rwanda Standards Board (RSB), and Rwanda Development Board (RDB) and these served as key informants.

3.3.1 Inclusion Criteria

Individuals who were qualified to be a participant in this research study; were personnel in the food industry and food policy making institutions with at least 3 years of working experience in that food policy making domain or food industry domain.

3.3.2 Exclusion criteria

On the other hand, if a potential participant is/was at the same time working in one of the food policy making institutions (i.e.; RDB) and food industry (i.e.; Hotel).

3.4 Sample size

The sample size for the current study was reached by using the following formula (46)

$$\text{Sample Size} = \left[\frac{z^2 * p (1-p)}{e^2} \right] / 1 + \left[\frac{z^2 * p (1-p)}{e^2} * N \right]$$

Where the population size is labeled as N; the population size for accredited tourism entities equals 208 and the population size for food manufacturers equals 79 resulting in 287 study subjects/food manufacturers all operating in Gasabo District, Z represents a 1.96 z-score which is a constant associated with the desired confidence level of 95%, P is 50% as the estimated proportion of the population with a certain characteristic, and E equals +/- 5% as the desired margin error respective to the selected confidence interval.

As per the above formula, the quantitative sample size for accredited tourism entities equals 135 and the sample size for food manufacturers equals 66 resulting in 201 study participants. The obtained sample size was then multiplied by 2 to get the total number of respondents since we took at least 2 respondents at every manufacturing site (hotels & industry) because one food manufacturer can employ several quality assurance managers, production managers, waiters and waitress, chief cooks, assistant cooks operations' managers, as well as other several technical staffs and supporting staff depending on working shifts, production capacity, food products category being handled and so on.

For qualitative, the focus is on in-depth exploration and understanding rather than generalizability. Depending on data saturation that means collecting data until no new information or themes emerge, it permitted 30 participants (10 participants from each food regulatory body, i.e. Rwanda FDA, RDB and RSB) participated in focus group discussions, depending on the complexity of the research questions and the richness of the gathered data.

3.5 Sampling technique

A probability stratified sampling/selection technique was employed to choose participants for quantitative data, giving every person or unit food manufacturer in the community an equal chance of being chosen. This was accomplished by giving each individual a unique identity number that excludes data like personal identifiers, personal relationships, family information, and employment details.

Due to circumstances where time, resources, or accessibility are scarce for the majority of government officials, the researcher chose participants FGDs for qualitative data using a non-probability convenience sample technique.

Table 1: Illustration of the study’s respondents with respect to their area of operations;

Food Domain \ Food sector	Food regulators	Food industry
Rwanda FDA	10 Respondents	
Rwanda Standards Board	10 Respondents	
Rwanda Development Board	10 Respondents	
Food Manufacturers (Hotels & Industries)		403 Respondents

3.6 Data collection method

A one-day exercise of data collection was practiced as testing of the instrument by 5 data collectors who were trained 5 days prior to starting the data collection activity. The key activities were theoretical and practical sessions, mock interviews, and pre-testing of the instruments. After adjusting the study instruments, data collection activity started.

- **Questionnaire**, a structured set of questions designed to collect data from participants was administered in a paper-based format and online survey-assisted. Questionnaires typically consisted of closed-ended questions with pre-defined response options, although they also include open-ended questions during qualitative data collection.
- **Focus Group Discussions (FGDs)**, 6FGDs of 5 people who had experience in the food industry and policy development institutions (Rwanda FDA, RSB and RDB) were also conducted in a comfortable and relaxed setting of conference rooms, where participants felt free to share their thoughts and opinions. The discussion was led by a moderator who asked open-ended questions and encouraged participants to share their views, the FGDs were audio-recorded.

3.7. Variables

- **Dependent Variable:**

The dependent variable in this assessment is the compliance/noncompliance of the measures taken by the given food industry to ensure its compliance with the available food policy governing the food industry. This variable represents the desired outcome of effective policy implementation, such as reduced foodborne illnesses, improved food safety practices, and enhanced public health outcomes through S-Mark by RSB certification, Premise licensing by Rwanda FDA and Product registration by Rwanda FDA.

- **Independent Variables:**

The rest of the variables represent the independent variable that assessed experience, the level of knowledge, safety measures, challenges, calibrations, use of SOPs, importance, accreditations, production and distribution measures, responsible certifiers among food industry owners regarding food policies and public health concerns, they also include measures such as their understanding of food safety regulations, awareness of health risks associated with improper food handling, and knowledge of best practices for maintaining food safety. All of these were grouped as follow;

Sociodemographic: This independent variable examined gathered set of characteristics used to describe and categorize our study participants through social and demographic characteristics including gender, age, work experience and consideration of cultural factors.

Food Policy Adherence: This independent variable examined the extent to which food industry owners comply with food policies and regulations. It includes factors influencing compliance or non-compliance, their adherence to food safety routine through availability of the responsible technician, support for prioritization of environmental friendly food policies and importance of food policy for public health protection.

Products' Characteristics: This group of independent variables gathered specific attributes, qualities, and features that describe and differentiate food products. These characteristics are essential for consumers, producers, and regulators to understand what a food product is, how it is made, its nutritional content, and its quality and it has examined product category, ensuring food safety and quality and use of standard operating procedures.

Food Safety Measures: This independent variable assesses the are practices and procedures implemented in the food production, preparation, handling, and distribution processes to ensure that food products are safe to eat. It includes cross contamination prevention measures, equipment's calibration and food safety incident or recall in the last 3 years

Food Policy understanding & awareness: This independent variable evaluates the partnership between food industry owners, regulatory agencies, and other stakeholders involved in public health protection through food policy definition, awareness of food safety regulations and guidelines.

Food Policy Adoption: This independent variable focuses on the frequency and effectiveness of food inspections and monitoring conducted by regulatory authorities. It includes factors such as the regularity of inspections, the enforcement of penalties for non-compliance through important food policy for promotion of healthy food, production and distribution procedures and food policy evaluation

Stakeholders' shared responsibility towards Food Policy: This independent variable grouped crucial in the development and implementation of effective food policies that aims at comprehensive plans and regulations that aim to address various aspects of the food systems that represents governmental role in regulating the food industry, responsible certifiers and the level of training and education provided to food industry owners and their staff.

Food Policy Challenges: This independent variable represents emerged food policy challenges in implementing food policies, potential drawbacks or unintended consequences of food policies as well as challenges that are currently threatening the food industry. It assesses factors such as the exchange of information, feedback mechanisms, and partnerships aimed at improving policy implementation and addressing emerging challenges.

By examining the relationship between these independent variables and the dependent variable of public health protection, researchers and policymakers can assess the factors that influence effective policy implementation and identify areas for improvement.

Products' Characteristics

Measures ensuring the safety and quality of food products were categorized as follows

As = Follow Products' Standards

Bs = Good Hygiene Practices (GHP)

Cs = Follow Good Manufacturing Practices (GMP) Principles

Ds = Hazard Analysis and Critical Control Points (HACCP)

Es = None

This variable was grouped into Correct Measures and Not-Correct Measures,

- ❖ Where Those who chose As, Bs, Cs and Ds are considered as **Correct Measures**, whereas the rest of single response or combined responses other than As, Bs, Cs and/or Ds are considered as **Not-Correct Measures**

Food Safety Measures were grouped into complete and non-complete

- ❖ **Complete measures** grouped handwashing, hygiene of premises and hygiene of equipment, whereas **Non-Complete** grouped only “handwashing”, “hygiene of premises”, “hygiene of equipment”, “handwashing and hygiene of premises”, “handwashing and hygiene of equipment”, or “hygiene of premises and hygiene of equipment”,

Awareness and information outreach

This variable was grouped into **Adequate Way**; Those who chose Government and Regulatory Agency Websites, Industry Associations & Networks and **Inadequate Way**; Those who chose Research and Scientific Publications and Professional Training and Workshops

Food Policy Adoption

This variable was grouped into **Aware** and **Not Aware**.

- **Aware** stands for respondents who chose any of Es, Fs or Gs)
 - Es = Product registration
 - Fs = Premise licensing
 - Gs = Good Manufacturing Practices

Or a possible combination of the above

- **Not-Aware** stands for respondents who chose any of As, Bs, Cs or Ds)
- As = Food labelling requirements
- Bs = Restrictions on advertising unhealthy foods to children
- Cs = Tightened regulations on junk foods/unhealthy drinks
- Ds = Subsidies for healthy foods

Or a possible combination of the above

Key challenges currently threatening the food industry were grouped into **Severe Challenges** grouped respondents who made 4 combinations among As, Bs, Cs and Ds, **Major Challenges** grouped respondents who made 3 combinations among As, Bs, Cs and Ds, **Minor Challenges** grouped respondents who made 2 combinations among As, Bs, Cs and Ds and **Less Challenges** grouped respondents who made 1 combination among As, Bs, Cs and Ds

- ❖ Where
- As = Too many food policies
- Bs = Unrealistic food policies
- Cs = High cost of implementation
- Ds = Ignorance

Responsible institutions to provide individual certifications related to food safety were grouped into a **Complete list of responsible certifiers** (Combination of all of the 4 possible answers among Rwanda FDA, RSB, RDB and NGOs) and **an incomplete list of responsible certifiers** (Combination of all of less than 4 possible answers among Rwanda FDA, RSB, RDB and NGOs)

3.8 Data analysis procedures

For qualitative; the FGDs were audio-recorded and transcribed verbatim by 2 research assistants. The principal investigator checked the transcripts for quality against the original recordings and against the field notes for accuracy. Atlas. Ti analytic software (version 7.5.10) was used for coding and analyzing data. All transcripts were analyzed inductively with respect to the following phases of thematic analysis: familiarization with data, generating initial codes, selection, review, definition, and naming of themes as well as reporting. (47) Codes were reviewed and discussed by the author. These codes in turn were grouped into major families and then into themes representing reported food policy making practices, challenges, and responses applied to overcome challenges. In presenting the data, relevant verbatim quotes were translated from Kinyarwanda to English by the principal investigator and were reported to aid the interpretation of the data in each theme.

Quotations are tagged by participant group (1 = Male, 2 = Female, RF = Rwanda FDA's participant, mothers, RS = RSB's participant and RD = RDB's participant)

For quantitative data; statistical analysis using descriptive statistics (frequencies, percentages) and logistic regression (univariate, bivariate and multivariate) analysis were performed to evaluate the relationship, significance and association between predicted and outcome variables. STATA software version 18.0 was used for statistical analysis to generate the results that were presented in tables with interpretations of odds ratios, p-value <5% and confidence interval of 95%.

The multivariate logistic regression model was used to examine the connection between various independent variables which were significant in bivariate analysis and the outcome of compliance with available food policies. The goal is to understand how these independent variables interact to influence compliance or non-compliance with available food policies by considering the odd ratio (OR) as a measure of association.

A positive correlation with compliance to available food policies is shown by an OR larger than one, and a negative association (protective factor) that is indicated by an OR less than one.

The "p-value" column reflects the statistical significance of each variable response. A low p-value (typically less than or equal to 0.05) indicates that a variable response has a statistically significant impact on the outcome variable of complying with available food policies. When the influence of other factors in the model is evaluated, adjusted ORs provide a more realistic portrayal of the variable response's impact.

3.9 Ethical considerations

Ethical approval No.: CMHS/IRB/328/2023 was granted by the University of Rwanda's Institutional Review Board (IRB) approval

Voluntary participation and consenting process

Respecting the autonomy of research participants and allowing them to make their own decisions about whether or not to participate in the research, the research has considered obtaining informed consent from research participants by making sure that participants understand the purpose and risks of the research and thus voluntarily agreed to participate.

Confidentiality

The researcher ensured privacy and confidentiality by protecting the privacy and confidentiality of research participants by keeping their personal information and data secure and not sharing it without their consent after an intensive risk and benefit analysis to see if the potential benefits outweigh the potential risks for the participants.

Data protection

Acting in the best interests of the research participants and avoiding causing harm to them, ensuring that the research is conducted in a fair and unbiased manner and that it does not discriminate against any particular group or individual by assigning unique identifiers to participants, rather than using their names. All data collected are securely stored electronically with strong passwords and coded in a manner that can't disclose a participant.

CHAPTER 4: RESULTS

4.1. Univariate analysis of Sociodemographic, Food Policy understanding & awareness and Products' Characteristics.

By considering table 2 of this study's findings, the food sector in the area of study was occupied by 66% of men and 34% of women whereas the majority of the respondents 67.99% were aged between 25 and 34 Years Old.

Regarding work experience, [3 to 5[years of working experience prevailed with 70.47%, followed by [5 to 8[years of working experience with 18.36%. Also 71.22% of the respondents marked sociocultural factors to be very important in complying with available food policies.

Regarding the product category, most of the respondents were based in low risks food products manufacturing/preparing factories with 49.13% while 9.43% followed by 41.44% of those who were in both high and low risks food products manufacturing/preparing industries.

The correct measures ensuring the safety and quality of food products were ranked at 56.58% of the respondents whereas 43.42% stood for respondents who took incorrect measures to ensure the safety and quality of food product

Standard Operating Procedures (SOPs) being documented guidelines and instructions that outline the steps of production processes toward consistent safety and quality parameters were found to be followed by 84.86% of the respondents while 10.17% of the respondents do not consider the use of SOPs and 4.96% were not even aware of what SOPs were.

As per the study's results, 91.32% of the respondents have chosen food policy to be laws and regulations that govern the production and distribution of food. Also 39.95% of the respondents received adequate awareness of food safety regulations and guidelines whereas 60.05% of the participants didn't receive adequate awareness of food safety regulations and guidelines

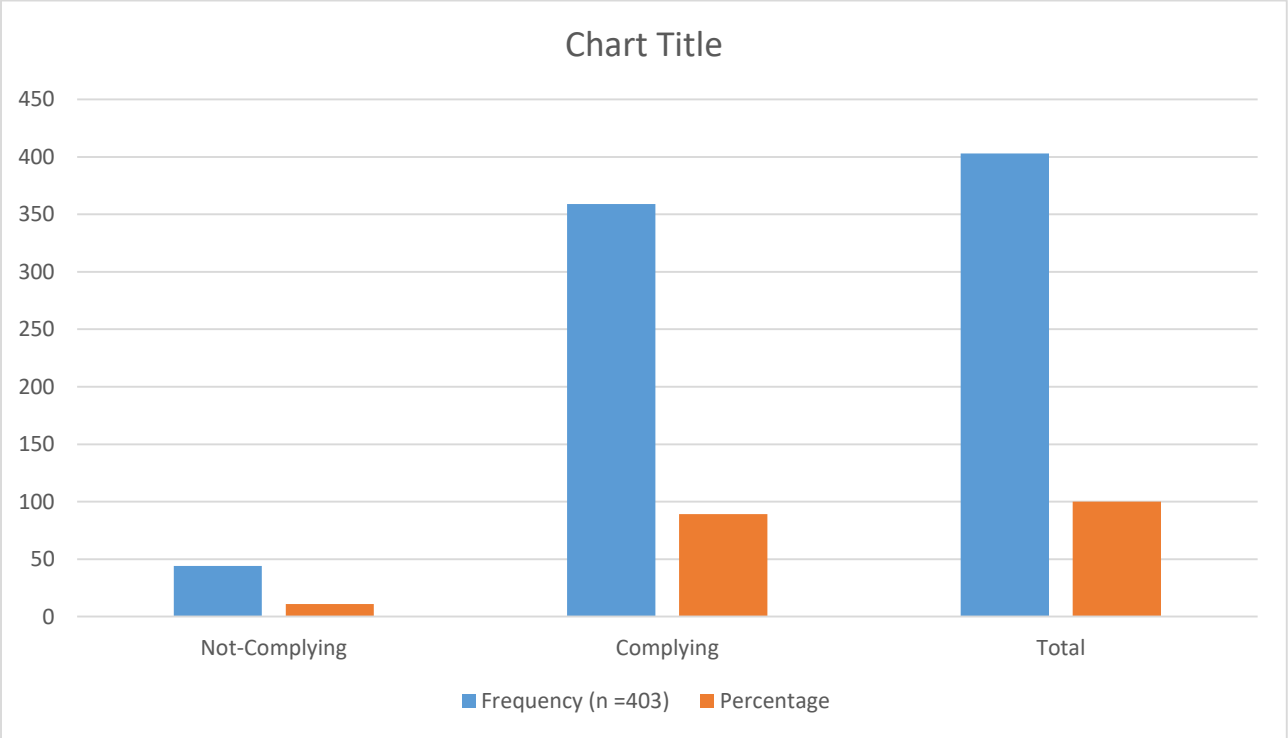
Table 2: Univariate analysis of Sociodemographic, Food Policy understanding & awareness and Products' Characteristics.

Gender	Frequency (n =403)	Percentage
Male	266	66
Female	137	34
Age		
Under 25 Years Old	34	8.44
Between 25 and 34 Years Old	274	67.99
Between 35 and 44 Years Old	84	20.84
Between 45 and 54 Years Old	9	2.23
Work Experience		
[3 to 5[Years of experience	284	70.47
[5 to 8[Years of experience	74	18.36
[8 to 10[Years of experience	22	5.46
[10 to 12[Years of experience and above	23	5.71
Cultural consideration when designing a food policy		
Very important	287	71.22
Somewhat important	79	19.6
Not very important	25	6.2
Not at all important	12	2.98
Product category		
High risk food products	38	9.43
Low risk food products	198	49.13
Both High risk and Low risk food products	167	41.44
Measures ensuring the safety and quality of food product		
Correct Measures	228	56.58
Not-Correct Measures	175	43.42
Use of Standard Operating Procedures (SOPs)		
Yes	342	84.86
No	41	10.17
Not aware	20	4.96

Food Policy Definition		
Production/distribution’s rules and regulations	368	91.32
Guidelines for healthy eating	25	6.2
A marketing strategy for promoting certain food products.	10	2.48
Awareness of food safety regulations and guidelines		
Adequate Way	161	39.95
Inadequate Way	242	60.05

4.1.1. Compliance level of the food industry toward existing food policies.

The food industry compliance level toward existing food policies can vary depending on Premise licensing and Product registration issued by Rwanda FDA, Operation license issued by RDB and S-Mark certification issued by RSB, Product registration by Rwanda FDA. Food businesses which complied to subjected requirements by the respective regulatory body were considered “Complying” whereas food businesses which failed to comply for at least one of the subjected requirements by the respective regulatory body were considered “Not-Complying” thus determining the compliance level of the food industry toward existing food policies.



4.2. Stakeholders' engagement toward food policy making and implementation

4.2.1. Univariate analysis of food policy adoption and stakeholders' shared responsibility towards food policy.

By considering table 2, 86.85% of the respondents were Aware of important food policies for the promotion of healthy food and Not-Aware with 13.15% of the respondents. Table 3 again revealed that 47.39% of respondents tested each produced batch, 36.48% of the respondents followed acceptance and rejection criteria whereas 11.41% tested some produced batches.

Regarding a continuous evaluation of food policy implementation, 44.17% of the respondents preferred it to be through scientific research and data analysis, 39.7% of the respondents preferred it to be through consumer surveys and feedback while 16.13% of the respondents preferred it to be through industry self-reporting and monitoring. Regarding the role of governments in regulating the food industry, 67.25% of the respondents do supported the implication of strict regulation and 28.25% of the respondents preferred moderate regulation.

For food safety training, 58.06% of the respondents claimed themselves to have been trained and certified while 41.94% of the respondents declared themselves as they didn't receive any related food safety training and certification. Regarding identification of responsible bodies in certifications related to food safety, 97.02% in the study were able to list Rwanda FDA, RDB, RSB and NGOs.

Table 3 revealed that 94.79% of the respondents declared food policy as of paramount importance when it comes to protecting public health. Whereas 53.35% of the respondents were aware of what it required to limit cross-contamination and 46.65% were unaware of how to limit cross-contamination.

Calibration of food manufacturing equipment, 67.49% of the respondents always considered calibrating their equipment on a 2 years' basis while 20.84% of the respondents do calibrate their equipment Once in a while. Regarding food safety incidents and recalls; 60.05% of the respondents didn't experience a food safety incident or recall in the last 3 years whereas 39.95% of the respondents experienced at least one food safety incident or recall in the last 3 years.

The study revealed that 86.6% of the respondents' business firms owned a responsible technician while 13.4% of the respondents' business firms did not own a responsible technician. And 92.31% of the respondents think it is eminent to prioritize food policies that promote sustainable and environmentally friendly food production.

Table 3: Univariate analysis of food policy adoption and stakeholders' shared responsibility towards food policy.

Important food policy for promotion of healthy food	Frequency (n =403)	Percentage
Aware	350	86.85
Not Aware	53	13.15
Production and distribution procedures		
Acceptance and rejection criteria	147	36.48
Test reports of each produced batch	191	47.39
Test reports of some produced batch	46	11.41
None of above	19	4.71
Food policy evaluation		
Through scientific research and data analysis	178	44.17
Through consumer surveys and feedback	160	39.7
Through industry self-reporting and monitoring	65	16.13
Governmental role in regulating the food industry		
Strict regulation	271	67.25
Moderate regulation	113	28.04
Do not apply regulation	19	4.71
Individual certifications related to food safety		
Yes	234	58.06
No	169	41.94
Responsible certifiers		
Complete list of Responsible certifiers	12	2.98
Not a complete list of Responsible certifiers	391	97.02
Availability of the responsible technician		
Yes	349	86.6
No	54	13.4
Support for prioritization of environmentally friendly food policies		
Yes	372	92.31
No	10	2.48
Not sure	21	5.21

Importance of food policy for public health protection		
Very important	382	94.79
Somewhat important	18	4.47
Not very important	3	0.74
Cross contamination prevention measures		
Complete	215	53.35
Non-Complete	188	46.65
Equipment's calibration		
Always (yearly)	272	67.49
Once in a while	84	20.84
Never calibrated	30	7.44
I'm not aware / I don't know	17	4.22
Food safety incident or recall in the last 3 years		
Yes	161	39.95
No	242	60.05

4.3. Univariate analysis of challenges associated compliance to available policies in food industry.

By considering the challenges in food policy implementation, limited resources for policy implementation came first with 42.93% of the respondents, followed by limited public awareness, support and/or enforcement with 34% of the respondents, resistance from the food industry and lack of political will with 15.38% and 7.69% respectively

Table 4 shows that 42.68% of the respondents pointed food policies pose a significant increase in the costs on the market, 32.75% of the respondents pointed food policies decreasingly impact the access to certain foods on the market whereas 24.57% of the respondents pointed food policies to negatively affect expected operations of their businesses.

Challenges that threatened the food industry, severe challenges mark 5.96%, major challenges occupied 15.38% while minor challenges 34% and fewer challenges contributed 44.67% of the key challenges currently that threatened the food industry.

Table 4: Univariate analysis of challenges associated compliance to available policies in food industry.

Challenges in implementing food policies	Frequency (n =403)	Percentage
Resistance from the food industry	62	15.38
Lack of political will	31	7.69
Limited resources for implementation	173	42.93
Limited public awareness, support and/or enforcement	137	34
Drawbacks or unintended consequences of food policies		
Increased costs for consumers	172	42.68
Reduced access to certain foods	132	32.75
Unintended effects on certain businesses	99	24.57
Challenges currently threatening the food industry		
Severe Challenges	24	5.96
Major Challenges	62	15.38
Minor Challenges	137	34
Less Challenges	180	44.67

4.4. BIVARIATE ANALYSIS OF FACTORS ASSOCIATED TO COMPLIANCE WITH AVAILABLE FOOD POLICIES.

The table 5 illustrates bivariate analysis of factors associated to compliance with existing food policies. The statistical analysis revealed that the p-value < 0.05 suggests that there is significant correlation/association between; Gender and compliance with available food policies (AOR=0.000), Product category and compliance with available food policies (AOR=0.000), “Presence of the responsible technician and Compliance with available food policies (AOR=0.005), Challenges in implementing food policies and Compliance with available food policies (AOR=0.000), Support for prioritization of environmentally friendly food policies and Compliance with available food policies (AOR=0.000), Measures ensuring the safety and quality of food product and Compliance with available food policies (AOR=0.000), Cross contamination prevention measures and Compliance with available food policies (AOR=0.007), Equipment’s calibration and Compliance with available food policies (AOR=0.000), Challenges currently threatening the food industry and Compliance with available food policies (AOR=0.000), Food safety incident or recall in the last 3 years and Compliance with available food policies (AOR=0.036), Awareness of food safety regulations and guidelines and Compliance with available food policies (AOR=0.000), Individual certifications related to food safety and Compliance with available food policies (AOR=0.002).

Again, the statistical analysis revealed that the p-value > 0.05 suggests that there is no significant correlation/association between; Age and compliance with available food policies (AOR=0.648), Food Policy Definition and compliance with available food policies (AOR=0.184), Work Experience and Compliance with available food policies (AOR=0.199), Importance of food policy for public health protection and Compliance with available food policies (AOR=0.257), Important food policy for promotion of healthy food and Compliance with available food policies (AOR=0.710), Governmental role in regulating the food industry and Compliance with available food policies (AOR=0.054), Cultural consideration when designing a food policy and Compliance with available food policies (AOR=0.296), Potential drawbacks or unintended consequences of food policies and Compliance with available food policies (AOR=0.114), Food policy evaluation and Compliance with available food policies (AOR=0.362), Use of Standard Operating Procedures (SOPs) and Compliance with available food policies (AOR=0.325), Production and distribution procedures and Compliance with available food policies (AOR=0.532), Responsible certifiers and Compliance with available food policies (AOR=0.218).

Table 5: Bivariate analysis of factors associated to compliance with available food policies.

Gender	Not-Complying	Complying	Total	P-Value
Male	16	250	266	0.000
	6.02	93.98	100	
Female	28	109	137	
	20.44	79.56	100	
Total	44	359	403	
	10.92	89.08	100	
Age				
Under 25 Years Old	2	32	34	0.648
	5.88	94.12	100	
Between 25 and 34 Year	32	242	274	
	11.68	88.32	100	
Between 35 and 44 Year	10	74	84	
	11.9	88.1	100	
Between 45 and 54 Year	0	9	9	
	0	100	100	
From 55 Years Old and Above	0	2	2	
	0	100	100	
Total	44	359	403	
	10.92	89.08	100	

Food Policy Definition				
Laws and regulations governing food production and distribution	39	329	368	0.184
	10.6	89.4	100	
Guidelines for healthy eating	5	20	25	
	20	80	100	
A marketing strategy for promoting certain food products.	0	10	10	
	0	100	100	
Total	44	359	403	
	10.92	89.08	100	
Work Experience				
[3 to 5[Years of experience	37	247	284	0.199
	13.03	86.97	100	
[5 to 8[Years of experience	4	70	74	
	5.41	94.59	100	
[8 to 10[Years of experience	1	21	22	
	4.55	95.45	100	
[10 to 12[Years of experience and above	2	21	23	
	8.7	91.3	100	
Total	44	359	403	
	10.92	89.08	100	
Product category				
High risk food product	10	28	38	0.000
	26.32	73.68	100	
Low risk food product	27	171	198	
	13.64	86.36	100	
Both High risk and Lo	7	160	167	
	4.19	95.81	100	
Total	44	359	403	
	10.92	89.08	100	
Importance of food policy for public health protection				
Very important	44	338	382	0.257
	11.52	88.48	100	
Somewhat important	0	18	18	
	0	100	100	
Not very important	0	3	3	
	0	100	100	
Total	44	359	403	
	10.92	89.08	100	
Presence of the responsible technician				
Yes	34	315	349	0.005
	9.74	90.26	100	
No	10	44	54	
	18.52	81.48	100	
Total	44	359	403	
	10.92	89.08	100	

Important food policy for promotion of healthy food					
Aware	39	311	350	0.710	
	11.14	88.86	100		
Not-Aware	5	48	53		
	9.43	90.57	100		
Total	44	359	403		
	10.92	89.08	100		
Challenges in implementing food policies					
Resistance from the food industry	17	45	62		0.000
	27.42	72.58	100		
Lack of political will	1	30	31		
	3.23	96.77	100		
Limited resources for implementation	19	154	173		
	10.98	89.02	100		
Limited public awareness, support and/or enforcement	7	130	137		
	5.11	94.89	100		
Total	44	359	403		
	10.92	89.08	100		
Support for prioritization of environmentally friendly food policies					
Yes	36	336	372	0.000	
	9.68	90.32	100		
No	0	10	10		
	0	100	100		
Not sure	8	13	21		
	38.1	61.9	100		
Total	44	359	403		
	10.92	89.08	100		
Governmental role in regulating the food industry					
Strict regulation	39	232	271	0.054	
	14.39	85.61	100		
Moderate regulation	5	108	113		
	4.42	95.58	100		
Do not apply regulation	0	19	19		
	0	100	100		
Total	44	359	403		
	10.92	89.08	100		

Cultural consideration when designing a food policy				
Very important	31	256	287	0.296
	10.8	89.2	100	
Somewhat important	9	70	79	
	11.39	88.61	100	
Not very important	1	24	25	
	4	96	100	
Not at all important	3	9	12	
	25	75	100	
Total	44	359	403	
	10.92	89.08	100	
Potential drawbacks or unintended consequences of food policies				
Increased costs for consumers	18	154	172	0.114
	10.47	89.53	100	
Reduced access to certain foods	10	122	132	
	7.58	92.42	100	
Unintended effects on certain businesses	16	83	99	
	16.16	83.84	100	
Total	44	359	403	
	10.92	89.08	100	
Food policy evaluation				
Through scientific research and data analysis	16	162	178	0.362
	8.99	91.01	100	
Through consumer surveys and feedback	18	142	160	
	11.25	88.75	100	
Through industry self-reporting and monitoring	10	55	65	
	15.38	84.62	100	
Total	44	359	403	
	10.92	89.08	100	
Ensured product's safety and quality measures				
Correct Measures	12	216	228	0.000
	5.26	94.74	100	
Not-Correct Measures	32	143	175	
	18.29	81.71	100	
Total	44	359	403	
	10.92	89.08	100	
Use of Standard Operating Procedures (SOPs)				
Yes	37	305	342	0.325
	10.82	89.18	100	
No	3	38	41	
	7.32	92.68	100	
I'm not sure	4	16	20	
	20	80	100	
Total	44	359	403	
	10.92	89.08	100	

Cross contamination prevention measures				
Complete	15	200	215	0.007
	6.98	93.02	100	
Non-Complete	29	159	188	
	15.43	84.57	100	
Total	44	359	403	
	10.92	89.08	100	
Equipment's calibration				
Always (yearly)	23	249	272	0.000
	8.46	91.54	100	
Once in a while	7	77	84	
	8.33	91.67	100	
Never calibrated	11	19	30	
	36.67	63.33	100	
I'm not aware / I don't know	3	14	17	
	17.65	82.35	100	
Total	44	359	403	
	10.92	89.08	100	
Production and distribution procedures				
Acceptance and reject criteria	17	130	147	0.532
	11.56	88.44	100	
Test reports of each batch	17	174	191	
	8.9	91.1	100	
Test reports of some batch	7	39	46	
	15.22	84.78	100	
None of above	3	16	19	
	15.79	84.21	100	
Total	44	359	403	
	10.92	89.08	100	
Challenges currently threatening the food industry				
Severe Challenges	1	23	24	0.000
	4.17	95.83	100	
Major Challenges	0	62	62	
	0	100	100	
Minor Challenges	3	134	137	
	2.19	97.81	100	
Less Challenges	40	140	180	
	22.22	77.78	100	
Total	44	359	403	
	10.92	89.08	100	

Food safety incident or recall in the last 3 years				
Yes	24	137	161	0.036
	14.91	85.09	100	
No	20	222	242	
	8.26	91.74	100	
Total	44	359	403	
	10.92	89.08	100	
Awareness of food safety regulations and guidelines				
Adequate Way	4	193	197	0.000
	2.03	97.97	100	
Inadequate Way	40	166	206	
	19.42	80.58	100	
Total	44	359	403	
	10.92	89.08	100	
Individual certifications related to food safety				
Yes	16	218	234	0.002
	6.84	93.16	100	
No	28	141	169	
	16.57	83.43	100	
Total	44	359	403	
	10.92	89.08	100	
Responsible certifiers				
Complete list of responsible certifiers	0	12	12	0.218
	0	100	100	
Incomplete list of responsible certifiers	44	347	391	
	11.25	88.75	100	
Total	44	359	403	
	10.92	89.08	100	

4.5. Bivariate analysis for Sociodemographic, Food Policy understanding & awareness and Products' Characteristics.

The odds of complying with available food policies were 4.49 times higher in male food product manufacturers than in females. All the other variables were not significant.

Compared to manufacturers who took correct measures in ensuring the safety and quality of food products, manufacturers who didn't take correct measures to ensure the safety and quality of food products were less likely to comply with available food policies (AOR=0.24, CI: 0.24, 0.12 - 0.52).

Compared to food manufacturers who had received inadequate awareness, food manufacturers who had received adequate awareness were 11.63, (CI: 4.07 - 33.18) times more likely to comply with available food policies.

Compared to food businesses that manufactured low risk food products, food businesses that manufactured both high risk and Low risk food products were 3.46, (CI: 1.43 - 8.35) times more likely to comply with available food policies while those manufacturing high risk food products were less likely to comply with available food policies (AOR=0.37, CI: 0.15 - 0.91).

Table 6: Bivariate analysis for Sociodemographic, Food Policy understanding & awareness and Products' Characteristics.

	Odds Ratio	95% confidence interval	P-Value
Gender			
Female	1		
Male	4.49	2.21 - 9.12	<.001
Age			
Under 25 Years Old	1		
Age Between 25 and 34 Years Old	0.29	0.06 - 1.34	.114
Age Between 35 and 44 Years Old	0.24	0.05 - 1.22	.084
Age From 55 Years Old and above	0.49	0.2 - 1.17	.108
Age Between 45 and 54 Years Old	0.28	0.11 - 0.71	.479

Work experience			
[3 to 5[Years of experience	1		
[5 to 8 Years[Years of experience	2.39	0.81 - 7.08	.117
8 to 10 Years[Years of experience	1.55	0.18 - 13.09	.688
[10 to 12 Years] Years of experience	0.56	0.11 - 2.81	.482
Urgency of cultural factors consideration when designing a food policy			
Very important	1		
Somewhat important	0.92	0.4 - 2.11	.843
Not at all important	0.44	0.1 - 1.87	.266
Not very important	4.22	0.53 - 33.86	.175
Food Policy Definition			
Laws and regulations that govern the production & distribution of food	1		
Guidelines for healthy eating	0.47	0.15 - 1.5	.203
A marketing strategy for promoting certain food products	0.2	0.07 – 0.57	.997
Awareness of food safety regulations and guidelines			
Inadequate Way	1		
Adequate Way	11.63	4.07 - 33.18	<.001
Product category			
Low risk food products	1		
Both High risk and Low risk food products	3.46	1.43 - 8.35	.006
High risk food products	0.37	0.15 - 0.91	.03
Measures ensuring the safety and quality of food product			
Correct Measures	1		
Not-Correct Measures	0.24	0.12 - 0.52	<.001
Use of Standard Operating Procedures (SOPs)			
Yes	1		
No	2.47	0.69 - 8.86	.164
I'm not aware / I don't know	0.65	0.18 - 2.3	.503

4.6. Bivariate analysis for food policy adoption and stakeholders' shared responsibility towards food policy.

Compared to food manufacturers who were not-aware of important food policies for the promotion of healthy food, food manufacturers who were aware of important food policies for the promotion of healthy food were less likely to comply with available food policies (AOR=0.83, CI: 0.31 - 2.21).

Compared to food manufacturers who followed food policy evaluation through industry self-reporting & monitoring, food manufacturers who followed food policy evaluation through consumer surveys & feedback were 1.65, (CI: 0.69 - 3.95) times more likely to comply with available food policies while food manufacturers who follow food policy evaluation through scientific research and data analysis were 2.29, (CI: 0.92 - 5.67) times more likely to comply with available food policies.

Compared to food manufacturers who didn't follow any production and distribution procedure, food manufacturers who tested each produced batch were 2.8, (CI: 3.69 - 11.27) times more likely to comply with available food policies while those manufacturers who tested some produced batches were 1.48, (CI: 0.33 - 6.72) times more likely to comply with available food policies and those food manufacturers who followed acceptance and rejection criteria were 1.78, (CI: 0.45 - 6.97) times more likely to comply with available food policies.

Compared to food manufacturers who revealed that the governmental role in regulating the food industry should be through strict regulation, food manufacturers who revealed that the governmental role in regulating the food industry should be through moderate regulation were 4.81, (CI: 1.81 - 12.79) times more likely to comply with available food policies while food manufacturers who revealed that governmental role in regulating food industry shouldn't be by applying regulations were less likely to comply with available food policies (AOR=0.43, CI: 0.15 - 1.53).

Compared to food manufacturers who had not individual certifications related to food safety among their staff, food manufacturers who had individual certifications related to food safety among their staff were 3.14, (CI: 1.61 - 6.14) times more likely to comply with available food policies.

Compared to food manufacturers who were not-sure of supporting the prioritization of environmentally friendly food policies, those who supported prioritization of environmentally friendly food policies were 6.56, (CI: 2.49 - 17.26) times more likely to comply with available food policies while food manufacturers who didn't support prioritization of environmentally friendly food policies less likely to comply with available food policies (AOR=0.36, CI: 0.16 - 0.8).

Compared to food manufacturers who didn't have responsible technicians, food manufacturers with responsible technicians were 2.11, (CI: 1.97 - 14.56) times more likely to comply with available food policies.

Compared to food manufacturers who took non-complete measures to prevent cross-contamination, food manufacturers who took complete measures to prevent cross-contamination were 2.56, (CI: 1.18 - 5.57) times more likely to comply with available food policies

Compared to food manufacturers who never calibrated their equipment, food manufacturers who calibrated their equipment on a 2 years' basis are 6.27, (CI: 2.66 - 14.76) times more likely to comply with available food policies while those who had once in a while calibrated their equipment are 6.37, (CI: 2.18 - 18.61) times more likely to comply with available food policies compared to food manufacturers who never calibrated their equipment.

Table 7: Bivariate analysis for food policy adoption and stakeholders' shared responsibility towards food policy.

	Odds Ratio	95% confidence interval	P-Value
Important food policy for promotion of healthy food			
Not-Aware	1		
Aware	0.83	0.31 - 2.21	.017
Food policy evaluation			
Through industry self-reporting monitoring	1		
Through consumer surveys and feedback	1.65	0.69 - 3.95	.026
Through scientific research and data analysis	2.29	0.92 - 5.67	.074
Production and distribution procedures			
None of above	1		
Test reports of each produced batch	2.8	3.69 - 11.27	.014
Test reports of some produced batch	1.48	0.33 - 6.72	.609
Acceptance and rejection criteria	1.78	0.45 - 6.97	.409

Governmental role in regulating the food industry			
Apply strict regulation	1		
Apply moderate regulation and enforcement	4.81	1.81 - 12.79	.002
Do not apply regulation	0.43	0.15 - 1.53	.999
Individual certifications related to food safety			
No	1		
Yes	3.14	1.61 - 6.14	.001
Responsible certifiers			
Incomplete list of responsible certifiers	1		
Complete list of responsible certifiers	0.62	0.45 - 5.23	.999
Importance of food policy for public health protection			
Not very important	1		
Very important	0.66	0.43 - 25.32	.999
Somewhat important	0.46	0.37 - 7.34	.509
Availability of the responsible technician			
No	1		
Yes	2.11	1.97 - 14.56	.021
Support for prioritization of environmental friendly food policies			
Not sure	1		
Yes	6.56	2.49 - 17.26	<.001
No	0.36	0.16 - 0.8	.012
Cross-contamination prevention measures			
Non-Complete	1		
Complete	2.56	1.18 - 5.57	.018

Equipment's calibration			
Never calibrated	1		
Always on a 2 years basis	6.27	2.66 - 14.76	<.001
Once in a while	6.37	2.18 - 18.61	.001
I'm not aware / I don't know	2.7	0.63 - 11.53	.18
Food safety incident or recall in the last 3 years			
Yes	1		
No	1.71	0.88 - 3.32	.112

4.7. Bivariate analysis for challenges associated compliance to available policies in food industry.

Compared to food manufacturers who met challenges of limited public awareness, food manufacturers who met challenges related to the lack of political will were 2.2, (CI: 0.25 - 19.53) times more likely to comply with available food policies while those who met challenges related to limited resources for implementation were less likely to comply with available food policies (AOR=0.36, CI: 0.14 - 0.96) and those who met challenges related to resistance from the food industry were less likely to comply with available food policies (AOR=0.2, CI: 0.07 - 0.57).

Compared to food manufacturers who answered that unintended consequences / potential drawbacks due to food policies imply reduced access to certain foods, food manufacturers who answered that unintended consequences / potential drawbacks due to food policies imply increased costs of food were less likely to comply with available food policies (AOR=0.49, CI: 0.2 - 1.17) and those who answered that unintended consequences / potential drawbacks due to food policies imply unintended effects on certain businesses were less likely to comply with available food policies (AOR=0.28, CI: 0.11 - 0.71).

Table 8: Bivariate analysis for challenges associated compliance to available policies in food industry.

	Odds Ratio	95% confidence interval	P-Value
Challenges in implementing food policies			
Limited public awareness	1		
Limited resources for implementation	0.36	0.14 - 0.96	.041
Resistance from the food industry	0.2	0.07 - 0.57	.002
Lack of political will	2.2	0.25 - 19.53	.479
Drawbacks or unintended consequences of food policies			
Reduced access to certain foods	1		
Increased costs for consumers	0.49	0.2 - 1.17	.108
Unintended effects on certain businesses	0.28	0.11 - 0.71	.007
Challenges threatening the food industry			
Severe challenges	1		
Minor challenges	2.47	0.24 - 25.86	.451
Fewer challenges	0.19	0.02 - 1.51	.117
Major challenges	0.14	0.85 - 4.91	.998

4.8. Multivariate analysis of the outcome and significantly related variables

After considering variable responses, 12 variables were statistically significantly associated to compliance with available food policies. These included Increased costs for consumers [AOR (0.74); CI (0.16 - 3.44), P value 0.027] and having a responsible technician [AOR (1.61); CI (0.13 - 2.97), P value .045]. Also, male food sector practitioners were 5.5 times more likely to comply with available food policies than female food sector practitioners. Food manufacturers who consider food policy compliance to be achieved through moderate regulations were 7.16 times more likely to comply with available food policies than those who consider food policy compliance to be achieved through strict regulation. Food manufacturers who took correct measures to ensure the safety and quality of food products were 4.88 times more likely to comply with available food policies than those who didn't take correct measures to ensure the safety and quality of food products.

Food manufacturers who followed measures to prevent cross-contamination were 5.78 times more likely to comply with available food policies than those who didn't follow measures to prevent cross-contamination.

Food manufacturers who received adequate awareness of food safety regulations and guidelines are 14.1 times more likely to comply with available food policies than those who didn't receive adequate awareness of food safety regulations and guidelines. Food manufacturers with a staff who possesses individual certifications related to food safety were 2.53 times more likely to comply with available food policies than those who didn't have a staff who possesses individual certifications related to food safety.

Table 9: Multivariate analysis of the outcome and significantly related variables

	Odds Ratio	95% confidence interval	P-Value
Gender			
Female	1		
Male	5.5	1.79 - 16.87	.003
Product category			
High risk food products	1		
Low risk food products	2.83	1.64 - 12.59	.026
High and Low risk food products	0.18	0.03 - 1.09	.171
Availability of the responsible technician			
No	1		
Yes	0.61	0.13 - 2.97	.064
Important food policy for promotion of healthy food			
Not-Aware	1		
Aware	0.92	0.19 - 4.33	.912

Challenges in implementing food policies			
Limited public awareness	1		
Limited resources for implementation	1.55	0.26 - 6.3	.762
Resistance from the food industry	1.28	0.09 - 27.93	.766
Lack of political will	0.14	0.03 - 0.61	.009
Support for prioritization of environmental friendly food policies			
Not sure	1		
Yes	0.94	0.09 - 27.93	.916
No	0.96	0.12 - 6.44	.921
Governmental role in regulating the food industry			
Apply strict regulation	1		
Apply moderate regulation	7.16	1.43 - 35.93	.017
Do not apply regulation	0.15	0.05 - 0.48	.001
Potential drawbacks or unintended consequences of food policies			
Reduced access to certain foods	1		
Increased costs for consumers	0.74	0.16 - 3.44	.027
Unintended effects on certain businesses	0.22	0.04 - 1.07	.061
Food policy evaluation			
Through industry self-reporting monitoring	1		
Through consumer surveys and feedback	2.39	0.53 - 10.87	.259
Through scientific research & data analysis	3.99	0.67 - 23.72	.128
Measures ensuring the safety and quality of food product			
Not-Correct Measures	1		
Correct Measures	4.88	1.48 - 16.04	.009
Cross contamination prevention measures			
Non-Complete	1		
Complete	5.78	1.72 - 19.49	.005

Equipment's calibration			
Never calibrated	1		
Always on a 2 years basis	1.32	4.36 - 16.87	<.001
Once in a while	0.12	0.05 - 0.3	.681
I'm not aware / I don't know	0.35	0.09 - 1.38	.135
Production and distribution procedures			
None of above	1		
Test reports of each produced batch	0.88	0.1 - 7.67	.905
Acceptance and rejection criteria	0.26	0.03 - 2.33	.23
Test reports of some produced batch	0.31	0.03 - 3.36	.335
Awareness of food safety regulations and guidelines			
Inadequate Way	1		
Adequate Way	14.1	2.71 - 73.22	.002
Individual certifications related to food safety			
No	1		
Yes	2.53	1.78 - 8.17	.004

4.9. Qualitative data results

Overview of the results

Two themes emerged from the data: Firstly, a discourse on optimal practices that reflects the knowledge about, and efforts to align with recommendations on food sector practitioners' proper compliance with available food policies. All aspects were reported by all groups. Secondly, challenging situations encountered that hinder optimal practices and approaches applied to cope were present in a discourse on struggling with everyday reality.

Theme 1. “The versatile extents of compliance”: Discourse on food sector practitioners towards compliance with available food policies.

This theme represents participants’ discourse on how they attempt to follow recommendations on optimal compliance with available food policies:

Food safety remains an issue to combat with the help of meaningful food policy implementation practices Most of the participants across all the different categories of respondents reported that ensuring food safety from farm to table is becoming more complex due to cross-contaminations, outbreaks, and food fraud concerns.

“Technological gaps as unequal access to technology and digital resources limited food sector practitioners’ ability to limit cross-contamination by automating critical processing steps and accessing relevant/related policy materials where most of the approved food policies get uploaded to institution’s websites whereas most of the stakeholders are not digital literates” FGD-RF3

“Leveraging technology and data for improved food safety through calibrating food manufacturing equipment, following products standards, ensuring traceability, and transparency became increasingly remarkable in larger firms compared to smaller firms thus efficiency and reliability of food systems towards compliance with available food policy may not be easily distinguishable from capital resources” FGD-RD5

Scepticism and inconsistent enforcement Some food sector practitioners do question the effectiveness of certain policies, especially if they really respond/reflect to the real problems in the food industry as they seem to be disconnected from practical realities. FGD-RD3

“Inconsistencies in regulatory enforcement lead to confusion and undermine the credibility of food policy makers and this complacency can have several negative consequences for food safety and quality including lower investment in compliance when food sector entrepreneurs start operations without consulting responsible regulatory institution” FGD-RF5

“Participants, across all the different categories, reported that food sector practitioners received awareness of information about compulsory compliance with available food policies during mapping activity, thus by promoting and enforcing compliance, consequences related to non-compliance and ignorance shall be introduced because subjective compliance is also a compliance, no matter the way through” FGD-RS4

Willingness to comply Not all food sector practitioners are genuinely committed to producing safe, high-quality food products with a willingness to comply with food policies some of them might be profit-oriented without considering public health protection.

“Some of the food sector practitioners are resistant to policy changes, especially if they perceive them as burdensome or costly. For example, there is one food manufacturer that I am not going to disclose but we caught him 4 times falling under the same mistake of packaging alcoholic beverages in plastic bottles while it contradicts rules and regulations despite fining him every time we caught him. They resist adopting new practices or technologies required for compliance” FGD-RD2

“Peer influence and pressure within the industry can either promote or deter compliance. Some practitioners adopt practices endorsed by their colleagues and industry associations without considering their public health effects and motives of the given policies because you sometimes get surprised by what we see during inspections where a big branded company suffer safety incidents despite the market reputation whereas some small company impress us by taken measures toward ensured food safety with an example of S-Mark certification being a marketing tool rather than regulatory requirements” FGD-RS2

Theme 2. “Struggling with every day’s challenges”: Discourse on Challenges impeding optimal practices to comply with available food policies and the coping approaches applied

Participants talked about various challenging situations inhibiting adequate food policy implementation as well as approaches used to overcome these challenges

Stakeholders' consultation prior to policy implementation Several participants emphasized that stakeholder consultation prior to the implementation of food policies is a crucial step in the policy development process. Stakeholder engagement helps ensure that policies are well-informed, practical, and widely accepted.

“Economic pressures, including fluctuating food prices also affect food affordability and availability, where market-driven forces lead to the proliferation of high quantity produced with less food quality and that small and medium-sized enterprises, seemed to present several barriers hindering full regulatory adherence” FGD-RD4

“Some stakeholders in general have more power, resources, or influence than others, leading to unequal bargaining power in collaborative efforts, it also leads to small producers feeling undermined that policies are designed for only big businesses without caring to small ones and that’s why building trust among stakeholders is essential for effective collaboration because perceived biases can hinder collaboration efforts” FGD-RF2

Perceived overregulation Some practitioners may feel burdened by what they perceive as excessive regulations and compliance requirements from several government institutions, leading to frustration and potential resistance.

“For example, frustrations regarding tourism entities closure at 1 am during working days and 2 am closure on weekend days is currently being seen as an obstacle to business and may trigger loose compliance due to feeling unvalued/un-consulted during that policy initiation might result in poor submission, refusal/delay in submitting applications for renewal of operations” FGD-RF1

“Due to bureaucratic inertia, competing interests, lack of will, education, food literacy, limited access to education and low food literacy hinders food handlers’ ability to comply with existing food policies being considered as too much of unnecessary modernization by sticking to old-ways handling that didn’t harm them for years and/or cost of implementation” FGD-RS5

Communication & awareness Respondents made it clear that building efforts are essential for achieving food policy compliance among various stakeholders through communication & awareness

“Establish transparent and open communication channels to share information, updates, and decisions is essential. Regular meetings updates can help build trust, develop mechanisms for addressing conflicts, disagreements, mediation or arbitration processes that help to establish accountability throughout the sector” FGD-RD1 & FGD-RD3

"Regarding the consideration of stakeholders engagement toward food policy making and implementation when designing/updating new policies, we always collaborate with, Rwanda Consumer's Rights Protection Organization (ADECOR), NGOs with related mandate, Rwanda Hospitality Association (RHA), Rwanda Association of Manufacturers (RAM) and Rwanda Cooperative Agency (RCA) but there are instances that happen often where a governmental institution introduce new rule through only it's social media means without prior stakeholders consultation of points of view as obliged" FGD-RS3

Financing Securing adequate resources and support for all stakeholders involved, especially those with fewer resources or limited capacity but with education and offering training and capacity-building opportunities to stakeholders who may need additional skills or knowledge to participate effectively.

“Provision of incentives for participation, such as recognition & certifications, funding, or benefits that align with stakeholders' participation during food policy formulation”
FGD-RF4

“Collaboration allows stakeholders to pool their expertise, resources, and knowledge to comprehensively address complex problems, collaborative efforts distribute responsibility and making it easier to address challenges that no single entity can tackle alone” FGD-RS1

CHAPTER 6: DISCUSSION OF THE RESULTS

The current study identified specific areas where further education and outreach efforts are required. This discussion focuses to the following key factors discussed key factors; the gender of food industry practitioner, role of government in regulating the food industry, linkage between environment and food policy, cross-contamination prevention measures, information awareness on available food policies, calibration of food equipment, food product category, individual certifications related to food safety and challenges impeding food industry to comply with available food policies.

✓ To assess the compliance level of the food industry toward existing food policies

Being a male food industry practitioner is a demographic factor that is taken into consideration during the survey because it influences various aspects of the food sector due to gender-related socio-cultural preferences that can affect professional performance. (48) Women are more involved in extra activities related to their families than males thus causing being absent or deconcentrate during some activities, the level of training and awareness regarding workplace policies can impact compliance. Employees who are more readily available than others may result in being better informed about policies and their importance and are more likely to comply. (49)

Individual food safety certifications play a crucial role in ensuring food policy compliance within the food industry. These certifications demonstrate that individuals have received specialized training and have the knowledge and skills required to handle food safely and adhere to food policies and regulations. (63) Properly trained and certified personnel are better equipped to identify and mitigate food safety risks. This reduces the likelihood of foodborne illness outbreaks, recalls, and legal liabilities associated with non-compliance. (64)

✓ To investigate stakeholders' engagement toward food policy making and implementation

The governmental role in regulating the food industry is crucially eminent in maintaining routines and behavior adoption, for example, (50) it has been noticed that local BBAB manufacturers claim to have been producing such beverages for so long ago without facing safety concerns and now regulations are being tough for them when manufacturing local alcoholic beverages. Sticking to that routine despite several emerged safety cases including but not limited to deaths and blindness caused being poorly manufactured BBABs, sociocultural factors were taken into consideration. Government agencies establish and enforce regulations to ensure the safety of food products through behavior change and communication whereas sociocultural factors sometimes hinder food production, primarily when traditional cultural practices or beliefs clash with modern food processing methods. (51)(52)

Production requires inputs and sometimes inputs are money-demanding, challenges related to limited resources may hit hard on businesses that are on a journey toward food compliance with food policy that may sometimes require skilled staff, equipment and technological adaptation. (65) Insufficient resources may hinder the ability to implement and enforce food safety measures effectively. This can lead to contaminated or unsafe foods to reach consumers, resulting in illnesses, hospitalizations, and, in severe cases, fatalities. (66)

Increased costs for consumers were the most prevailing potential drawbacks or unintended consequences of food policies, undesired effects can negatively harm the intended goal, and compliance with available food policy requires a seamless flow of implementation since policy implementation can't be dropped off investment can sometimes require money as inputs. (67) It is automatically understandable that the implementation cost will result in purchasing cost thus increased cost shall be a potential drawback or unintended consequence to compliance with available food policies. (68)

✓ **To identify the factors associated with compliance to available policies in food industry.**

Calibration of food equipment is a critical process that ensures the accuracy and reliability of measurements and controls in various stages of food production, processing, and quality assurance. Accurate equipment is essential for maintaining food safety, consistency, and product quality. (55) Adequate equipment calibration plays an important role in food safety when food is handled and produced. Calibration ensures that equipment monitors a food process accurately and consistently, and controls physical, chemical, or biological hazards in the food operation. (56)

Information is the key in whichever career you are pursuing, in the food manufacturing/preparation industry the right information can define, play and determine the level of food policy implementation thus awareness of formulated food policies shows that if the sector is not complying it's due to other related factors other than policy formulation and outreach. (57) Individuals involved in food production, from farmers and processors to chefs and restaurant staff, need to be aware of food safety principles, best practices, and regulations. This knowledge equips them to handle food safely and prevent contamination.(58)

The link between environment and food policy is profound and interdependent. Food policies have direct and indirect effects on the environment, and the state of the environment significantly influences the effectiveness and sustainability of food policies by evaluating behaviors of food handlers who are willing to comply with other general requirements thus revealing a good attitude when it comes to food policy implementation and compliance. (53) Environmental and food policies are interconnected because they both have a profound impact on the health of our planet, the sustainability of our food systems, and the well-being of human populations. (54)

Cross-contamination prevention measures can be linked with foodborne illness caused by cross-contamination outbreaks due to practitioners who are not aware of the correct combination. (59) since many foodborne illnesses are caused by pathogens that thrive in the presence of cross-contamination. Implementing prevention measures reduces the likelihood of pathogens spreading in the kitchen or food production facility. (60)

Low-risk food products typically have a minimal likelihood of causing harm to consumers when prepared, handled, and consumed following standard food safety practices. These products are considered less hazardous compared to high-risk foods, which are more prone to spoilage, contamination, or foodborne illness. However, even low-risk food products must adhere to food policy compliance to maintain their safety and quality. (61) Low-risk foods often have inherent characteristics that make them less prone to contamination and spoilage. These characteristics may include high acidity (e.g., citrus fruits), low water activity (e.g., dried grains), or high salt content (e.g., salted crackers), which inhibit the growth of harmful microorganisms. (62)

Taking correct measures when ensuring the safety and quality of food products is obvious, food product safety depends on right or wrong procedures whether intentional or unintentional, it is in that regard that the more correct measures taken, the safer the product is defined.

The strength of this study is its respondent diversity and crosscutting through food policy makers and implementers. The quantitative responses and qualitative ideas voiced out can therefore be taken as an exact reflection of food sector considerations, beliefs, and practices. Nevertheless, the study suffered from a number of limitations: Firstly, the participants were recruited in only one district, Gasabo, the findings may not be generalized to populations outside this area due to some specificities as well as the less representative sample from one District.

However, as statistical sample size was considered and data saturation was reached during data collection, the findings were adequate to provide a deeper understanding of the extent to which the food businesses comply with current food regulations and identify the factors that influence food policy compliance among owners of the food business that allow for a judgment of the extent to which findings can be relevant and applicable to other similar settings. Secondly, there was the inability to observe the actual food handling practices among food sector practitioners and food policy formulation strategies as reported by participants during the focus group discussions. Future research that emphasizes direct observations of food handling practices, policy formulation and communication strategies in everyday life would be valuable. Thirdly, FGD participants might have over-reported their perceptions and influences due to sociability. This might have been more evident for the Rwanda FDA's participants in FGD's responses as daily colleagues of the researcher. However, the interviewer asked the same questions in different forms as much as possible to check for consistency in the responses.

CHAPTER 7: CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

Our findings revealed a mixed landscape of compliance within the food industry. While a significant proportion of food business owners exhibited compliance extents with commendable adherence to food safety regulations. A substantial portion still falls short of full compliance where larger establishments were generally linked with higher levels of adherence than smaller businesses.

The compliance level of the food industry toward existing food policies was higher in general and this is a positive outcome for various stakeholders, including consumers, regulatory authorities, and the food industry itself. The compliance level as per the results of this study can be explained that male food sector practitioners are linked to higher levels of compliance than females while food business that handle low risk food products possess increased levels of compliance that the rest whereas compliance levels of those who received adequate awareness are also higher than those food businesses which didn't access adequate awareness regarding the available food policies.

Several factors emerged as influential in shaping compliance behavior among food businesses. Challenges related to limited resources and unintended consequences of increased cost of implementation were identified as challenges for businesses striving to meet compliance requirements. Particular constraints among small and medium-sized enterprises presented barriers to full regulatory adherence. The Impact of male food sector practitioners, low-risk food products, calibration of equipment always on a 2 years' basis, adequate awareness, application of moderate regulations, complete measures to prevent cross-contamination, training and certification have demonstrated higher compliance rates with available food policies.

Furthermore, our research highlighted the critical role of versatile agencies of stakeholders in promoting and enforcing compliance. Effective enforcement mechanisms, including regular inspections and clear penalties for non-compliance, were associated with improved compliance rates among businesses.

6.2 Recommendations

This research study suggests that, in accordance with governmental gender norms inclusion programs, female food sector practitioners be encouraged to join the sector as well as luring sponsors to involve females in trainings that prompt proper sector understanding and compliance with existing food policies.

Also since science has proven to ensure the safety of both high risk and low risk products in people's daily life, by considering personal preference the population shall access whatever food product regardless of their category thus food manufacturers are subjected to comply with safer food production.

Calibration of food manufacturing machines is a critical process in the food industry to ensure the consistency, accuracy, and safety of food products, it is in that regard that the study recommends that manufacturers to regularly calibrate their equipment prior to manufacturing/preparation of food products.

It again advises high and low risk food products manufacturers as well as only high risk food products manufacturers to be cautious because any manufacturing defect can harm the life of the consumer.

The process begins with the development and adoption of food policies. This stage involves policy formulation, drafting, and gaining political support. It's crucial for policies to be evidence-based, considering the latest research on nutrition, health, and food systems.

This study also advises food product manufacturers to employ at least trained and certified staff rather than staffs who are not trained and certified about food safety.

It again advises food policy making institutions to increase awareness, amalgamate all government institutions regulating food-related businesses into one institution that is crosscutting and improve communications channels so that newly adapted measures reaches to all concerned food business.

Ensuring the safety and quality of food products through testing each produced batch before placing them on the market can help in food policy compliance as well as public health protection.

Food manufacturers are recommended to maintain food safety because increased costs for consumers are not respective to food policy compliance since business reputation, closure, legal actions and fines are all risks that are associated with not complying with food safety and are much higher than safety routine's inputs as manufacturers can't manage to increase products' cost in such situations.

Funding the sector through different approaches like capacity building, easy loan accessibility, and Governmental or organizational support to people's businesses by increasing the product value chain can all inhibit challenges related to limited resources.

7. REFERENCES

1. Sadiku M, et al. *Food Industry: An Introduction*, 2019.
2. Mizzi L. *Food and nutrition policy in Malta*, 1995.
3. Christine L. *What Does a Food Technologist Do?* 2020.
4. Matua F, et al. *A rapid review of foodborne disease hazards in East Africa*, 2021.
5. Orolugbagbe G. *Food Safety: An Overview*, 2016.
6. Australian Institute of Health and Welfare. *Health promotion and health protection*, 2022.
7. Rwanda FDA. *Guidelines for application for registration of processed food*, 2019.
8. Rwanda FDA. *Guidelines for registration and licensing of food premises*, 2022.
9. Dudeja P. *Good food manufacturing practices*, 2018.
10. Kenya Bureau of Standards. *Product registration guidelines*, 2021.
11. FAO. *Introduction to Hazard Analysis and Critical Control Point (HACCP)*, 2023.
12. FAO. *Introduction and control of food hazards*, 2014.
13. University of North Dakota. *Sanitation & Food Safety Standard Operating Procedure*, 2018.
14. Bardsley A, et al. *The future of food & the primary sector: The journey to sustainability*, 2020.
15. FAO. *Strengthening sector policies for better food security and nutrition results*, 2017
16. Espinosa R, et al. *The acceptability of food policies: Nutrients*. 2021.
17. UNECE. *The Water Convention: 30 Years of Impact and Achievements on the Ground*, 2022.
18. Dr. Gundo A, et all. *Food safety is everybody's responsibility*, 2019.
19. WHO. *Foodborne diseases: Global burden*, 2019.
20. The Food Foundation. *Recommendations for policy makers, food businesses & investors*, 2021.
21. Government of Rwanda. *Law establishing Rwanda Food and Drug Authority*, 2018.
22. Government of Rwanda. *Law establishing Rwanda Development Board*, 2008.
23. Government of Rwanda. *Law establishing Rwanda Standards Board*, 2013.

24. The World Bank. Rwanda's economy continued to achieve strong growth in 2022 despite weakening external demand and restrictive monetary policies required to control inflation. 2023.
25. Sanchez M, et all. *Food Loss and Waste: Evidence for Effective Policies - Special Issue Food Policy*, 2020.
26. Sabreen W, et all. *Exploration of food security challenges towards more sustainable food production*, 2022
27. Republic of Rwanda. *Pathways for Rwanda's food systems transformation in support of the SDGs 2030*, 2020.
28. Rwanda FDA. *Mapping of the food processing industries and importers in Rwanda*, 2021.
29. Rwanda Development Board. *Licensed Tourism Entities*, 2023
30. Republic of Rwanda. *National food and nutrition policy*, 2014.
31. McKenna M. *Young Children Suffer Most, Says First Global Foodborne Illness Report*, 2015.
32. Kamboj S, et al. *Food safety and hygiene: A review*, 2020.
33. William A, et all. *The Economics of Malnutrition: Dietary transition and food system transformation*, 2022.
34. American Academy of Microbiology. *Global food safety: Keeping food safe from farm to table*, 2009.
35. Christian C. *Informed food choice*, 2019.
36. Donald M, et all. *Food Safety Compliance*, 2021
37. Murwira t, et all. *The Level of Compliance of Food Handlers with National Regulations on Food Hygiene and Safety Practices*, 2017.
38. Roman E, et all. *The Acceptability of Food Policies*, 2021.
39. Djekic I, et all. *Role of the Food Supply Chain Stakeholders in Achieving UN SDGs*, 2021
40. Patricia B. *The Role of Consumer Advocacy in Strengthening Food Safety Policy*, 2018.
41. Sabrina A, et all. *Insights on the role of private and public actors in food assistance provision*, 2017.

42. Lama B, et al. *Using media to impact health policy-making: an integrative systematic review*, 2017.
43. FAO. *Strengthening sector policies for better food security and nutrition results*, 2020.
44. Xavier I. *The cost - Benefit analysis of food safety policies: Is it useful?* 2008
45. FAO. *Nutrition, education and awareness raising for the right to adequate food*, 2014
46. Daniel W. *Biostatistics: A Foundation for Analysis in the Health Sciences*, 1999.
47. Braun V, et al. *Using thematic analysis in psychology*, 2006.
48. FAO. *Gender mainstreaming in nutrition*, 2012.
49. FAO. *Women and sustainable food security*, 2011.
50. FAO/WHO. *The role of governments and other regulatory authorities in meat hygiene*, 2004.
51. Tang L. *Cultural Changes and Food Production*, 2017.
52. Robert W, et al. *Achieving behaviour change; A guide for national government*, 2020.
53. Marrone P. *Food Policy: Integrating Health, Environment and Society*, 2013.
54. FAO. *Sustainable food systems; Concept and framework*, 2018.
55. United Nations Industrial Development Organization. *Role of measurement and calibration in the manufacture of products for the global market*, 2006.
56. Labfacility. *ISO17025 (UKAS) calibration standards*, 2016.
57. Khanal A, et al. *Food Safety Awareness, Food Policies, and Gender: A Review and an Empirical Examination from Nepal*, 2023.
58. Nyawo T, et al. *Food Safety and Hygiene: Knowledge, Attitude and Practices among Food Handlers*, 2021.
59. FAO/WHO. *Code of hygienic practice for fresh fruits and vegetables*, 2013.
60. Kennedy J, et al. *Determinants of cross-contamination during home food preparation*, 2011.
61. FAO. *Food safety risk management; Evidence-informed policies and decisions, considering multiple factors*, 2017.

62. Ottawa Network for Education. *Understanding Food-Borne Illness and Low-Risk and High-Risk Foods*, 2022.
63. Silverman G. *Effect of a Manager Training and Certification Program on Food Safety and Hygiene in Food Service Operations*, 2010.
64. Lambert R. *A Review of Certification and its Impact on Regulatory Intervention*, 2021.
65. Mukute M, et al. *A study to inform the development of an Africa food policy framework*, 2021.
66. FAO. *Nutrition-sensitive investments in agriculture and food systems Budget analysis guidance note*, 2020.
67. World Bank. *Special Focus: Food Price Shocks - Channels and Implications*, 2010.
68. Rivai A. *The monetary policy impact on agricultural growth and food prices*, 2022.
69. Ahmed Z, et al. *Food Supply Chain Transformation through Technology and Future Research Directions; A Systematic Review*, 2021.
70. Edward A, et al. *Sociocultural Influences on Food Choices and Implications for Sustainable Healthy Diets*, 2020
71. Koen D, et al. *The food systems approach in practice: Our guide for sustainable transformation*, 2020.
72. The Organization for Economic Co-operation and Development (OECD), *Implementing food safety regulation and third-party certification in crisis situation*, 2021.
73. Melissa L, et al. *Food politics and development*, 2020.
74. Raffaella C, et al. *Sustainability and Internal Control Systems in the Food and Pharmaceutical Sectors*, 2016.
75. Dalnim L, et al. *Factors associated with the risk perception and purchase decisions of Fukushima-related food in South Korea*, 2017.
76. Cambridge University Press. *Food Safety Compliance*, 2021
77. Nyawo T, et al. *Food Safety and Hygiene: Knowledge, Attitude and Practices among Food Handlers*, 2021.

78. Shilpa c, et all. *Stakeholder engagement strategies for policy and programmatic uptake*, 2020.
79. Jamuna P. *Role of education and training of food handlers in improving food safety and nutrition*, 2022.
80. Henjum S, et all. *Evaluation and prioritization of food environment policies in Norway using the Healthy Food Environment Policy Index*, 2023
81. Douglas A, et all. *The Food Recall Manual*, 2018. Giuseppe A, et all. *Food Contaminants*, 2014.
82. Farahani P. *Integrated production and distribution planning for perishable food products*, 2012.
83. Radovanovic R. *Food Safety: The Global Problem as a Challenge for Future Initiatives and Activities*, 2012.
84. Roberta L, et all. *Food Safety Policy Environment: Constraints and Challenges for Growing Food Businesses*, 2022.

=====END=====