

REPUBLIC OF BURUNDI



Situational analysis of food safety control systems in Burundi

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Abbreviations and acronyms

| | |
|--------|---------------------------------------------------------|
| AIDS | Acquired Immunodeficiency Syndrome |
| DHS | Demographic and Health Survey |
| FAO | Food and Agriculture Organization of the United Nations |
| HIV | Human Immunodeficiency Virus |
| ILRI | International Livestock Research Institute |
| IPC | Integrated Food Security Phase Classification |
| OHCHR | Office of the High Commissioner for Human Rights |
| PNLT | Programme National Lèpre et Tuberculose |
| UNICEF | United Nations Children's Fund |
| USAID | United States Agency for International Development |
| WHO | World Health Organization |

1. Introduction

1.1. Background

An effective national food control system protects the health and safety of domestic consumers and provides a sound regulatory foundation for domestic and international trade in food. Understanding the functionality of such a system would enable countries to develop policies and legislation that not only improve health but also spur development. Inadequate knowledge on food safety can lead to poor handling of food products and contribute to foodborne illnesses.

Several factors are responsible for the poor state of food safety in low- and middle-income countries. Among these is the low number of trained and skilled persons to take charge of food safety. It is against this background that the International Livestock Research Institute (ILRI) and the CGIAR Research Program on Agriculture for Nutrition and Health held a training workshop on food safety. The workshop drew participants from countries in the East African Community and Ethiopia. Participants included representatives from academia, food safety regulation (health, veterinary, horticulture, and standards) and the East African Community desk on agriculture.

The objective of the workshop was to train academia, researchers, and regulators on food safety and contribute to creating a critical mass of food safety experts in the East African Community partner states who would campaign for and spearhead food safety transformation in their countries. Several topics were covered, including risk analysis, traceability, food laws, and policy formulation. The training was structured to strengthen the participants' capacity to assess the effectiveness of their national food control systems.

This report presents the research findings of a situational analysis and review of food safety control systems in Burundi. The research was led by a team of food safety experts from the University of Burundi, the Burundi Ministry of Public Health, and the Burundi Bureau of Standards and Quality Control.

1.2. Methodology

A combination of methods was used for data collection. First, a desk review was carried out on foodborne hazards and illnesses, based on data obtained from universities, ministries, and decentralized offices. Second, key informant interviews were carried out with knowledgeable authorities and technicians in the food safety system in Burundi. Third, since the country team comprised experts from several food safety domains, the team members met and discussed among themselves to formulate expert opinions that have been incorporated in the report.

2. Food safety stakeholders

2.1. Food control management

Access to safe, nutritious, and adequate foods is a basic human need and important for health and development. It is the responsibility of governments to provide safe food. Food control refers to the mandatory activities that governments undertake to provide safe food. Legal food control has its foundation in law and allows governments to plan and implement activities that enable the provision of safe food.¹

The components of a national food control system are (1) food legislations (laws and regulations), (2) food control management (policies, strategies, and coordination), (3) stakeholders (industry and consumers), (4) food inspections (trained and competent inspectors), (5) laboratory services (monitoring and surveillance) and (6) information, education, communication, and training (consumer organizations).

2.2. Regulatory agencies involved in safety of animal-source food

The livestock sector in Burundi growing and is a key contributor to the national economy. Animal-source foods are an important source of nutrition but are also readily perishable. Therefore, their quality control is essential to protect the health of consumers. Table 1 shows the various regulatory agencies involved in managing the safety of animal-source food.

Table 1: Stakeholders involved in safety of animal-source food

| Agency | Ministry | Where in the food chain | Mechanisms |
|-------------------------------------------------|----------------------------------------------------|-------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Burundi Bureau of Standards and Quality Control | Ministry of Trade, Transport, Industry and Tourism | Processing; packaging; transport; collection sites; markets; shops; consumers | Inspection of processes and practices Product licensing Surveillance of marketed products Training on standards and regulations Seizing of sub-standard or unlicensed products |
| National Centre of Food Technology | Ministry of Environment, Agriculture and Livestock | Processing | Laboratory analysis of products Popularization of food technologies to small agro-processing units Training and assisting agro-processors Adaptation of artisanal processing equipment for smallholders |
| Directorate of Health Promotion, | Ministry of Public Health and Acquired | Informal slaughter sites; abattoirs; landing sites; food | Inspection of practices, processes, and products Dissemination of information |

¹ <http://www.fao.org>

| | | | |
|---------------------------------------------------------------|--------------------------------------------------------|------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Hygiene and Sanitation | Immunodeficiency Syndrome (AIDS) Control | processing sites; collection sites; eating places; markets; shops | Training producers, processors, and consumers on good hygienic practices Surveillance of foodborne disease outbreaks Establishment of laws related to hygiene and sanitation |
| Directorate of Animal Health (National Veterinary Laboratory) | Ministry of Environment, Agriculture and Livestock | Smallholder and commercial farms; informal slaughter sites; abattoirs; landing sites; transport; exporters | Disease treatment at farm level Inspection of formal and informal slaughter sites Certification of carcasses Regulations (laws related to animal-source food standards) Seizing and destruction of animal-source food unfit for consumption |
| Faculty of Agronomy and Bioengineering, University of Burundi | Ministry of National Education and Scientific Research | Whole value chain | Research on animal health and husbandry Training of trainers on animal health and food processing and handling Training on animal disease detection and management |
| Burundi Institute of Agronomic Sciences | Ministry of Environment, Agriculture and Livestock | Whole value chain | Research on animal health and husbandry Diffusion of new findings and technology |

2.3. Regulatory agencies involved in safety of fruits and vegetables

The main products of fruit processing are beverages (juices, wine, citrus-based drinks, and cordials), confectionery, and preserves (jams). Of these, juices are the most encountered and best-known in the country. Processing integrates the fruit into a value chain ranging from fresh fruit to juice at various stages of concentration (syrup, nectar, wine, beer, jam etc.). The transformation process adds value to the fruit. This is one of the reasons for the rise of many fruit processing units across the country. Analysis of the strengths, weaknesses, opportunities, and threats of the current situation of the fruit and vegetable sector in Burundi is necessary to propose pragmatic solutions to address related problems. The fruit and vegetable sector contributes to improving nutrition, creating jobs, and diversifying sources of income. The sector has a high industrial potential and untapped commercial potential. Table 2 shows the agencies involved in managing the safety of fruits and vegetables.

Table 2: Stakeholders involved in safety of fruits and vegetables

| Agency | Ministry | Where in the food chain | Mechanisms |
|---------------------------------------------------------|----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Burundi Bureau of Standards and Quality Control | Ministry of Trade, Transport, Industry and Tourism | Packaging and cold storage; processing companies (dried and frozen fruit, juice, and pulp); distribution for export; transport to supermarkets and local retailers; display at markets, shops and kiosks | Inspection of processes and practices and licensing of end products Surveillance of marketed products Training on standards and regulations Seizing of sub-standard or unlicensed products |
| National Centre of Food Technology | Ministry of Environment, Agriculture and Livestock | Processing | Laboratory analysis of products and raw materials Popularization of food technologies to small agro-processing units Training and assisting agro-processors Adaptation of artisanal processing equipment for smallholders |
| Directorate of Health Promotion, Hygiene and Sanitation | Ministry of Public Health and AIDS Control | Eating places; markets; processing companies (dried and frozen fruit, juice, and pulp) | Inspection of practices, processes, and products Dissemination of information to consumers and producers Training producers, processors, and consumers on good hygienic practices Surveillance of foodborne disease outbreaks Establishment of laws related to hygiene and sanitation |
| Directorate of Plant Protection | Ministry of Environment, Agriculture and Livestock | Smallholder and commercial farms; harvesting | Accrediting and controlling the management of all stages of the life cycle of pesticides Surveillance of the use of chemical products Inspection of import and export of agricultural inputs Regulations on activities related to plant protection Seizing of unregulated pesticides and products |
| Faculty of Agronomy and Bioengineeri | Ministry of National Education | Whole value chain | Training of trainers on plant protection, fruit and vegetable processing and handling |

| | | | |
|--------------------------------------------------|-------------------------------------------------------------|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| ng, University of Burundi | and Scientific Research | | Training on detection and management of plant diseases Training on pesticide management |
| Burundi Institute of Agronomic Sciences | Ministry of Environment, Agriculture and Livestock | Whole value chain | Research on plant breeding, crop production, crop protection, and food crop processing Diffusion of new findings and technology |

The establishment of a quality infrastructure system is one of the most positive and concrete measures that a developing country can take to develop a dynamic economy and source of prosperity, health, and well-being. Quality infrastructure is a system that contributes to the achievement of public policy objectives in sectors such as industrial development, competitiveness on international markets, rational use of natural and human resources, food safety, public health, plant health, the environment, and climate change. It includes essential elements to meet the needs of a country’s citizens, consumers, businesses, and any other structure that provides them with goods and services. The inventory of the national quality infrastructure shows that the Burundi Bureau of Standards and Quality Control is the country’s national standardization body.

There are several agencies involved in food safety in Burundi, and the coordinating agency is the multi-sectoral platform for food security and nutrition. In addition to their food safety mandate, these agencies have several other non-conflicting roles (Table 3).

Table 3: Other roles of food safety agencies

| Agency | Other roles |
|---------------------------------------------------------------|--------------------------------------------------------|
| Burundi Bureau of Standards and Quality Control | Non-food products |
| National Centre of Food Technology | Food processing equipment |
| Directorate of Health Promotion, Hygiene and Sanitation | Public infrastructure |
| Directorate of Animal Health | Livestock husbandry |
| Faculty of Agronomy and Bioengineering, University of Burundi | Research and training on other agricultural areas |
| Burundi Institute of Agronomic Sciences | Research and dissemination on other agricultural areas |

The multi-sectoral platform for food security and nutrition is hosted in the Office of the President. It has a strategic plan that provides overall direction and essential elements to guide agencies in planning their actions and interventions. For each sector, a more detailed implementation plan is needed, integrating the tasks to be accomplished at predefined intervals (e.g., monthly or quarterly).

In Burundi, none of the food safety agencies use risk assessment to manage the safety of animal-source food, fruits, and vegetables, although the Directorate of Animal Health and the Burundi Bureau of Standards and Quality Control collaborate with the World Organisation for Animal Health and Codex Alimentarius, respectively.

3. Private sector and civil society

3.1. Food safety movements and associations

Burundi has few movements and associations that promote food safety. One example is the Organization for the Fight against Aflatoxins in Burundi that promotes food quality and safety. It was approved by Ministerial Order No. 530/447 of 19 March 2015. In addition, there are movements and associations that integrate the promotion of the quality of standards into their activities. This is notably the case of the sectoral chambers which make up the Federal Chamber of Commerce and Industry of Burundi, namely, the Sectoral Chamber of Agri-business of Burundi; the Association of Industrialists of Burundi; the Association of Merchants of Burundi; the Sectoral Chamber of Tourism and Hotels; the Sectoral Chamber of Art and Crafts; the Sectoral Chamber of Mines; the Sectoral Chamber of Transporters; the Sectoral Chamber of Customs Agencies and Transporters; the Sectoral Chamber of Building and Public Works Professionals; the Sectoral Chamber of Banks and Insurance; the Sectoral Chamber of Service Providers; the Sectoral Chamber of Information and Communication Technology; and the Sectoral Chamber of Women Entrepreneurs.

3.1.1. Consumer associations

By investing in consumer education and protection of consumer rights, consumer associations help to promote a quality and food safety culture among the population. They also work to guarantee the wellbeing of the population through the media, local training, and participation in the activities of technical standardization committees and sit on the boards of directors of public organizations. Consumer associations should be considered essential partners in the implementation of a national quality policy, both by public authorities and by businesses.

The Consumers Association of Burundi is the only consumer association in the country engaged in consumer advocacy, awareness, and education. It works on almost all aspects of consumption. Ministerial Order No. 530/204 of 7 September 1994 is one of the legal instruments governing the Consumers Association of Burundi which is affiliated with Consumer International.

The association has the following two missions: protection and promotion of consumer rights and promotion of good governance and the fight against corruption. There are two related centres in each of these two missions, namely, the centre for handling consumer complaints and the legal assistance and citizen action centre.

After approximately 26 years of existence, the Consumers Association of Burundi has achieved a significant level of social recognition and representation at the national level. It confirms that

today a consumerist culture is firmly anchored in Burundi. However, the association faces a number of challenges, including:

- insufficient financial and logistical resources to carry out public awareness, communication, and training campaigns;
- infrequent meetings of the association's decision-making bodies due to lack of resources;
- lack of specialist knowledge on quality management;
- lack of a framework for collaboration between the services in charge of quality and the association;
- lack of a national consumer code.

3.1.2. Quality and food safety management: Training firms and consultants

There are few emerging movements or associations with the role of promoting quality and food safety in Burundi. In most cases, these are certified international persons (consultants, trainers, and auditors) and quality management training institutes that support companies in setting up quality management systems, providing training on the various standards of the International Standards Organization and other quality procedures, and carrying out audits. The priority needs of companies in terms of quality and food safety include the following:

- awareness and training in quality and food safety management;
- audit training;
- acquisition of measuring equipment for quality and food safety control;
- drafting or revision of quality manuals and application of laboratory protocols;
- acquisition of appropriate packaging for products;
- strengthening of the framework of public and private sectors; and
- application of standards.

4. Food safety policy and regulatory framework

4.1. Technical regulation

A technical regulation is a document that sets out the characteristics of a product or the related processes and production methods, including the administrative provisions that apply to them, with which compliance is mandatory. The application of technical regulations aims to protect the health and safety of consumers and the environment. Technical regulations are also used to curb bad business practices. The development and application of technical regulations should be well coordinated and harmonized.

There is a regulatory framework specific to technical regulations at the Burundi Bureau of Standards and Quality Control and 217 national standards adopted have been made mandatory. Decision No. 750/0001 of 19 March 2015 lists the mandatory standards. The main technical regulations (decrees-laws, decrees, and ministerial ordinances) are listed below.

- Law No. 1/28 of 24 December 2009 on the health of domestic, wild, aquaculture animals, and bees

- Decree No. 100/99 of 31 March 2013 establishing the missions, organization, and operation of the national committee for the coordination and monitoring of sanitary and phytosanitary measures
- Decree-Law No. 1/17 of 7 May 1992 establishing a Bureau of Standardization and Quality Control
- Ministerial Ordinance No. 710/652 of 3 April 2019 setting the conditions and procedures for health inspection of animals and food products of animal origin
- Ministerial Ordinance No. 710/653 of 3 April 2019 on the examination of slaughter animals and veterinary health inspection of meat and meat products
- Ministerial Ordinance No. 710/654 of 3 April 2019 governing slaughterhouses and slaughter areas
- Law No. 1/23 of 23 November 2017 on plant protection in Burundi
- Law No. 1/14 of 27 April 2015 on the general regime of public–private partnership contracts
- Law No. 1/17 of 30 November 2016 on the organization of fisheries and aquaculture in Burundi
- Law No. 1/08 of 11 May 2018 on pesticide management in Burundi
- Decree-Law No. 1/16 of 17 May 1982 establishing the public health code
- Decree-Law No. 1/36 of 13 December 1989 establishing a standardization and quality control system
- Decree No. 100/68 of 18 March 2015 on the regulation of food fortification in Burundi
- Ordinance No. 710/451 of 4 April 2016 on phytosanitary and quarantine control measures in the trade in plants and plant products
- Ministerial Ordinance No. 750/1324 of 18 September 2013 appointing the members of the national committee for the coordination and monitoring of sanitary and phytosanitary measures
- Ministerial Ordinance No. 710/406 of 24 March 2003 on the national code of conduct for the management of pesticides
- Ministerial Ordinance No. 710/241 of 26 April 1999 appointing a national committee in charge of the approval and control of pesticides
- Ministerial Ordinance No. 710/954/98 of 29 December 1998 on implementing measures for Decree-Law No. 1/33 of 30 June 1993 on plant protection in Burundi;
- Ministerial Ordinance No. 710/837 of 29 October 2001 on the register of pesticides for agricultural use approved in Burundi
- Ministerial Ordinance No. 710/838 of 29 October 2001 on the register of pesticides for agricultural use, the import, marketing, distribution, and use of which are prohibited in Burundi

There are several plans, programs, projects, policies, laws, and strategies that constitute these technical regulations. Most legal texts constituting technical regulations are inconsistent while

their synergies and complementarities are necessary to be more effective.² These technical regulations mainly cover agriculture, trade, and health.³

- Burundi Vision 2025
- Strategic orientation document for the livestock sector (2016)
- National Agricultural Strategy, 2017–2030 (2017)
- National Agricultural Investment Plan, 2017–2022 (2017)
- National Industrialization Policy adopted by the Council of Ministers in July 2019 (its strategy is under development)
- National Development Plan, 2018–2027 (2018)
- Strategic framework for the development of horticulture (2013)
- Multi-sectoral strategic plan to fight malnutrition (2013)
- National Sanitation Policy and Horizon 2025 Operational Strategy (2013)
- The multi-sectoral platform for food security and nutrition was implemented in 2014. It creates a coordinating body for all activities related to food security and safety and includes both public and private stakeholders.
- The East African Nutritional Sciences Institute, created in 2018 to offer master's and doctorate degrees in nutrition and related sciences
- Regulation of food fortification to mitigate nutritional deficiencies and address the preventable devastating effects of micronutrient malnutrition (from 2015)
- Health policy of domestic, wild, and aquaculture animals and bees and their products and by-products (from 2009)
- Management of pesticides (from 2018)
- Organization of bars and restaurants (from 2020 and in progress)

There is a draft decree on the creation, missions, organization, and functioning of the Burundi Drug and Food Regulatory Authority. It was presented to the Council of Ministers in 2019 and is being amended for adoption.

The Burundi Institute of Management, Quality Control, Certification and Training, created in 2018, is a private institute responsible for carrying out audits to certify the management systems of companies, hotels, schools, and services. The institute has already established a partnership with the Swiss Association for Quality and Management Systems and Challenge Optimum Limited, a Swiss company.

The institutions involved in technical regulations are the Burundi Bureau of Standards and Quality Control (under the Ministry of Commerce, Transport, Industry and Tourism), the Directorate of Plant Protection, the Directorate of Animal Health, the Directorate for the Promotion of Animal Production, the National Centre for Artificial Insemination (under the

² Sindyikengera (2017)

³ Sindyikengera and Aboubacry (2019)

Ministry of Environment, Agriculture and Livestock) and the Department of Pharmacy, Medicines and Laboratories (under the Ministry of Public Health and AIDS Control).

The Board of Directors of the Burundi Bureau of Standards and Quality Control is responsible for coordinating and implementing these technical regulations, while the Ministry of Commerce, Transport, Industry and Tourism is responsible for notifications under the World Trade Organization agreements.

The Burundi Bureau of Standards and Quality Control and the Directorate of Plant Protection are the national information points, in accordance with the World Trade Organization agreements on technical barriers to trade and sanitary and phytosanitary measures.

4.2. Regulation and control: Inspection

Conformity assessment is the process of determining whether goods, services, systems, processes, personnel, etc. comply with standards, technical regulations, or technical specifications. A well-established conformity assessment infrastructure ensures that goods and services are safe and usable to ensure their competitiveness in target markets. Technical regulations are formulated in such a way that they do not create technical barriers to trade or other unnecessary obstacles within the context of the World Trade Organization agreement on technical barriers to trade. The conformity assessment infrastructure is, therefore, a trade facilitation tool and contributes significantly to the promotion of sustainable economic development.

The conformity assessment bodies are mainly

- inspection or control services;
- certification bodies; and
- analysis and testing laboratories.

4.2.1. Inspection

The inspection services are made up of technical structures of the following ministries:

- Ministry of Commerce, Transport, Industry and Tourism
- Ministry of Environment, Agriculture and Livestock
- Ministry of Public Health and AIDS Control
- Ministry of Infrastructure, Equipment and Social Housing
- Ministry of Hydraulics, Energy and Mines

Joint Ordinance No. 340/1698 of 19 November 2013 on quality control of products marketed in Burundi is one of the legal instruments relating to inspection. SGS is responsible for import inspection, while the Burundi Bureau of Standards and Quality Control checks the documents accompanying the goods and carries out market surveillance. In collaboration with the Burundi Bureau of Standards and Quality Control, the Internal Trade Department monitors the market by checking prices, balances, and strategic stocks. It has authority to prosecute in the event of

infringements and is involved in raising awareness of informal sector operators who wish to enter the formal sector. There is no coordination body for inspection at the national level.

Law No. 1/23 of 23 November 2017 on plant protection, in addition to the provisions on phytosanitary surveillance of the national territory, contains mechanisms for the inspection of plants, plant products, and other regulated articles intended for import and export. Law No. 1/08 of 11 May 2018 on pesticide management contains inspection mechanisms for pesticides used in the agricultural and industrial sectors as well as in health and public hygiene.⁴

Although Burundi has adequate legal instruments relating to plant health, the Directorate of Plant Protection does not have a laboratory for analysis of the quality of pesticides or their residues in food and the environment. In addition, the directorate has gaps in terms of appropriate infrastructure for the storage of pesticides, phytosanitary quarantine infrastructure, as well as mini laboratories for rapid diagnostics at declared entry points (border posts).

Quarantine centres are a very important element in the control of transboundary animal diseases and therefore contribute to the production of animals and animal products of good quality. The following three quarantine centres are already functional: Mishiha Quarantine Centre in Cankuzo, Mabanda Quarantine Centre in Makamba, and Mugina Quarantine Centre in Cibitoke.

Table 4: Food inspection bodies in Burundi

| Institution or department | Ministry | Activity |
|-------------------------------------------------|-------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Burundi Bureau of Standards and Quality Control | Ministry of Commerce, Transport, Industry and Tourism | Market surveillance; inspections at points of entry; verification of documents accompanying the goods |
| Internal Trade Department | Ministry of Commerce, Transport, Industry and Tourism | Market surveillance and monitoring (prices, balances, strategic stocks, etc.) in collaboration with the Burundi Bureau of Standards and Quality Control |
| Directorate of Plant Protection | Ministry of Environment, Agriculture and Livestock | Pesticide control; phytosanitary control on import and export of plants and plant products; plant quarantine in the trade of plants and plant products and issuance of phytosanitary certificates and import permits; notification of non-conformity |
| Directorate of Animal Health | Ministry of Environment, | Sanitary control and inspection and quarantine in the trade of animals and animal products, drugs and |

⁴ Sindyikengera (2020)

| | | |
|--------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|-----------------------------------------------------------------------------------|
| | Agriculture and Livestock | veterinary products, and issuance of health certificates |
| Directorate for the Promotion of Animal Production; National Centre of Artificial Insemination; Directorate for the Promotion of Fisheries | Ministry of Environment, Agriculture and Livestock | Control and inspection of seeds for artificial insemination, fry, and animal feed |
| Directorate of Hygiene | Ministry of Public Health and AIDS Control | Hygiene control and evaluation of the application of hygiene regulations |

In general, food inspection and control bodies (Table 4) face the following challenges:

- Ineffective regulatory framework due to inconsistencies in most legal texts
- Insufficient financial and material resources, particularly equipment and transport to cover the national territory
- Insufficient qualified staff
- Lack of rationalization and coordination in inspection activities
- Difficulty of acquiring and maintaining equipment
- Insufficient resources to conduct analysis on product compliance

4.2.2. Laboratory analysis and testing

Burundi has a network of testing laboratories (Table 5), all of which are not yet accredited. These laboratories support the activities of inspection bodies in assessing the conformity of imported and exported products, food products, water, harmful organisms (diseases, pests, weeds, etc.), plants and plant products, measuring instruments, etc.

Law No. 1/03 of 4 January 2011 on the National System of Standardization, Metrology, Quality Assurance and Testing constitutes, for the Burundi Bureau of Standards and Quality Control, one of the legal instruments relating to laboratory analysis and testing. The African Water Analysis Laboratory is one of the few private laboratories in the country. It performs physicochemical and microbiological analysis of water.

Table 5: Food analysis laboratories in Burundi⁵

| Laboratory | Supervisory structure | Area of competence |
|------------|-----------------------|--------------------|
|------------|-----------------------|--------------------|

⁵ Sindyikengera (2019)

| | | |
|-------------------------------------------------|---------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| Physicochemistry laboratory | Burundi Bureau of Standards and Quality Control | Physicochemical analysis of food and other miscellaneous products |
| Microbiology laboratory | Burundi Bureau of Standards and Quality Control | Microbiological analysis of food and other miscellaneous products |
| Biochemistry laboratory | National Centre of Food Technology | Biochemical analysis of food and other miscellaneous products |
| Microbiology laboratory | National Centre of Food Technology | Microbiological analysis of food and other miscellaneous products |
| Soil and agro-food products analysis laboratory | Burundi Institute of Agronomic Sciences | Analysis of soils, chemical fertilizers and amendments, plants and food products, water, and other miscellaneous products |
| Microbiology laboratory | Faculty of Agronomy and Bioengineering, University of Burundi | Microbiological analysis of food and other miscellaneous products |
| Physicochemistry laboratory | Department of Chemistry, Faculty of Sciences, University of Burundi | Physicochemical analysis of various products |
| National Veterinary Laboratory | Directorate of Animal Health | Analysis of animal diseases, drugs and veterinary products, and milk and animal feed for various toxins |
| Biomedical laboratory | National Institute of Public Health | Biomedical analysis and quality control of drugs, water, and food |
| Food analysis laboratory | Coffee Regulation Authority | Analysis of qualitative parameters and coffee tasting |
| African Water Analysis Laboratory | Private | Physicochemical and microbiological analysis of water |

These laboratories all face the following constraints:

- Insufficient repair and maintenance of equipment
- Insufficient quality management
- Insufficient use of existing equipment in some laboratories
- Insufficient chemicals and other consumables

- Difficulties in using certain laboratory devices
- Insufficient qualified technical staff
- Lack of chemical waste treatment services

Government food safety inspectors have legal authority to close firms that are not in compliance with food safety laws. They are also authorized to impose civil fines and seize and dispose of food that is unfit for consumption. Each agency has its specific internal rules and regulations. Graduates from technical schools and universities are recruited and trained as inspectors. The inspectors are different for each specific sector and there are opportunities available for their continuous professional development through capacity building.

Inspection activities usually focus on many parts of the food supply and there is more emphasis on regulation to approve food for export than for domestic markets. Meat and meat products are inspected frequently while fruits and vegetables are rarely inspected. Some factories are frequently inspected while others are rarely checked (e.g. factories producing ready-to-eat food are inspected more often than other types of factories). The inspection is often done towards the end of the value chain (end product) while the upstream nodes are rarely checked. The probability that an individual item of food has been inspected is given in Appendixes 1 and 2. A guide to this is also provided by the experts.

4.3. Certification

Certification is procedure by which a third party gives written attestation that a product, process, or service conforms to specified requirements. A distinction is made between ‘product certification’ and ‘system certification.’

4.3.1. Product certification

Ordinance No. 750/759 of 28 May 2013 on Application Procedures and Licensing for the Application of the Burundi Bureau of Standards and Quality Control mark is one of the legal instruments on certification in the country. There is a national system of certification of conformity of products to national standards. The Certification Division of the Burundi Bureau of Standards and Quality Control is in charge of the product certification system. It has granted 53 product certificates since July 2018, and 31 companies have benefited from the certification of their products.

The certification division is also making a significant effort in developing the system for product conformity assessment and licensing for the application of the Burundi Bureau of Standards and Quality Control mark on products. From 2018 through 2019, 15 companies received 47 licences for the application of the Burundi Bureau of Standards and Quality Control mark on their products.

The National Plant Protection Organization, in this case the Directorate of Plant Protection in the Ministry of Environment, Agriculture and Livestock, is the national body responsible for phytosanitary certification. Phytosanitary certification refers to the International Standard for Phytosanitary Measures No. 7–2011. This standard contains the requirements and describes the

elements of a phytosanitary certification system whose implementation is entrusted to the directorate.

Phytosanitary certificates are issued to indicate that consignments of plants, plant products or other regulated articles meet specific phytosanitary requirements of importing countries and comply with the certification statement of the corresponding model phytosanitary certificate. The Directorate of Plant Protection issues an average of 1,500 certificates per year.

4.3.2. System certification

Burundi does not have a national system certification body, and it is foreign institutions which offer these services.

4.4. Policies

4.4.1. National Health Policy 2005–2015 (2004)

Sections relevant to food safety

Nutrition and food security. Malnutrition has always existed sporadically during the lean season and during natural disasters (e.g., floods, droughts). Soil degradation and population pressure on arable land are two of the main causes of the food security problem. During this crisis it has become endemic, strongly affecting vulnerable groups (children, pregnant and nursing women, disaster victims). Although food self-sufficiency was largely maintained in the pre-crisis period, the desired transformation of productive structures did not take place, and the structural reforms initiated were not completed. The food deficit recorded at the end of 2002 is estimated at 167,000 tonnes of cereal equivalent, i.e., 14% of national production.

Major endemic diseases. Diarrhoeal diseases are caused by unsanitary housing conditions, unsanitary excreta disposal, unsafe water consumption, and poor hygiene practices. Tuberculosis is endemic in Burundi; its burden is considerable, with more than 6,000 cases reported each year for approximately 7 million inhabitants, representing an annual incidence of 8.57 per 10,000 inhabitants.⁶ Approximately 50% of patients present with tuberculosis/Human Immunodeficiency Virus (HIV) co-infection.

The problem or challenge

The nutritional situation of the population is characterized by a high prevalence of global acute malnutrition (6–17.8%) and severe acute malnutrition (1.1–4.1%) among children, depending on the region. The rate of chronic malnutrition rose from 48.1% in 1987 to 56.8% in 2000. Micronutrient deficiencies are frequent; the prevalence of endemic goitre is as high as 42% in some provinces, and anaemia is regularly observed (around 56%) in young children and pregnant women. The proportion of live birth weights under 2.5 kg is 15.1%, while the proportion of

⁶ PNLT (2004).

underweight children under five years of age is 45.1%. Vitamin A deficiency is widespread, and large-scale distribution has been introduced through the vaccination program.

Policy plans to overcome the challenge

1. Intensifying interventions to control communicable and non-communicable diseases by (i) strengthening disease prevention and management programs through appropriate technical support, with emphasis on the most vulnerable groups; (ii) setting up a system to prepare for and respond to health emergencies and natural disasters; and (iii) gradually improving the minimum and complementary packages of activities.
2. Reduction of maternal mortality by (i) availability of basic obstetric services at an affordable price; (ii) establishment of a fund to provide 100% subsidized care for obstetric emergencies in hospitals; (iii) improvement of the referral and counter-referral system by developing modern means of communication and transport; (iv) development of an equitable status for women; (v) promotion of education of young girls; and (vi) improvement of the use of family planning services.
3. Reduction of infant mortality by (i) maintaining the current level of immunization coverage for vaccine-preventable diseases; (ii) promoting exclusive breastfeeding; (iii) expanding integrated management of childhood illnesses; and (iv) integrated early childhood development through the promotion of community-based day-care centres (physical, social, emotional, spiritual, and intellectual development).
4. Reduction of the rate of malnutrition among children under five years of age and young children through (i) establishing a system of growth monitoring and community-based screening for malnutrition; (ii) establishing community-based nutrition programs; and (iii) providing school meals.
5. Reduction of the low birth weight rate by education and nutritional supplementation of pregnant women.

4. Detection and management of foodborne diseases

Foodborne diseases exist in Burundi as elsewhere in the world. However, sufficient data on their occurrence and causes are not always easy to find in reports. The Ministry of Health has maintained a database of foodborne diseases in the country since 2013. Experts have given their estimates (where data are not available) on the causes, pathology, and number of people affected (see Appendices 3, 4, 5 and 6). The literature has been consulted on major foodborne diseases associated with animal-source food, fruits, and vegetables, their causes, and control in Burundi. Information on education, communication, and training regarding food safety has also been collected.

4.1. Morbidity, mortality, and complications due to foodborne diseases or contaminated food

This section provides information on morbidity, mortality, and complications due to foodborne diseases/infections or contaminated food in Burundi in 2018 and 2019. Information on foodborne

illnesses due to food contaminated with pathogenic microorganisms is reported in the Ministry of Public Health and AIDS Control Statistical Yearbook for 2018 (Table 6 and Table 7).

The statistical yearbook is a national database consolidated from the country's health structures at the community level and is therefore a reference for management, planning, evaluation, guidance, monitoring, and decision-making.

Table 6: Morbidity caused by foodborne diseases

| Pathology | Number of cases |
|---------------------------------------------------------------|-----------------|
| Cholera | 332 |
| Bloody diarrhoea | 13,385 |
| Amoebiasis | 21,559 |
| Typhoid and paratyphoid fever | 7,633 |
| Gastrointestinal diseases presumed to be of infectious origin | 45,101 |
| Other <i>Salmonella</i> diseases | 2,615 |

Table 7: Mortality caused by contaminated food

| Pathology | Number of deaths |
|-------------------------------------------------------------------|------------------|
| Cholera | 43 |
| Bloody diarrhoea | 43 |
| Diarrhoea and gastroenteritis presumed to be of infectious origin | 169 |

4.2. Challenges related to food safety

4.2.1. Burundi nutrition profile⁷

Sections relevant to food safety

Nutrition and food security situation: Implementing sanitation practices is a challenge in Burundi. While 75% of the population has access to an improved water source, 95% do not treat their drinking water. Only 34% have access to an improved toilet, with 56% using non-slab or open latrines.⁸ These practices, coupled with flooding, increase the risk of disease. Burundi has suffered from recurrent cholera and malaria outbreaks, which further exacerbate the nutrition situation. As of October 2017, there were more than 6.6 million cases of malaria.⁹ While recurrent infection contributes to high levels of chronic malnutrition, it also has a more immediate impact on levels of acute malnutrition (wasting or low weight-for-height). Nine out of Burundi's 18 provinces are classified as having medium levels of acute malnutrition (between

⁷ USAID (2018)

⁸ Burundi Institute of Statistics and Economic Studies, Ministry of Public Health and AIDS Control and ICF International (2012)

⁹ OHCHR (2017)

5% and 9% according to the WHO/United Nations Children’s Fund [UNICEF] prevalence thresholds). Wasting is most prevalent in Kirundo (7.4%), Kayanza (7.4%), and Karusi (8.1%) provinces. Malaria, diarrhoea, and poor diet quality are contributing factors to acute malnutrition in the country.¹⁰

Problem or challenge

Malnutrition in childhood and pregnancy has many adverse consequences for child survival and long-term well-being. It also has far-reaching consequences for human capital, economic productivity, and national development. The consequences of malnutrition should be a significant concern for policymakers in Burundi. According to the 2016–2017 Demographic and Health Survey (DHS), the country has one of the highest rates of chronic malnutrition (stunting or low height-for-age) globally (56%), affecting over 1 million children under five years of age.¹¹ At 56%, Burundi’s child stunting prevalence is among the highest in the world; stunting levels among children under five years of age have only dropped by two percentage points between 2010 and 2016–2017. Similarly, prevalence of underweight and wasting have remained virtually unchanged over the same period. Rural areas have a much higher prevalence of stunting than urban areas, at 59% and 28%, respectively. Following this pattern, the province with the lowest prevalence of stunting (24%) is Bujumbura Mairie, the most urban of the provinces. In the rest of the country, which is more rural, the prevalence of stunting ranges from 49% in Bururi to 66% in Muyinga.¹²

How the policy intends to overcome the challenge

To end preventable child and maternal deaths, Burundi pledged to reduce the mortality of children under five years of age to 20 or fewer deaths per 1,000 live births by the year 2035 by reducing the leading preventable causes of child mortality, including undernutrition (A Promise Renewed 2017).

4.2.2. National Health Development Plan II (2011–2015)

Sections relevant to food safety

Food and nutrition

According to the joint evaluation report on harvests, Burundi’s production for the 2010 season barely allows food needs for three months to be covered. A gross food deficit of 412,000 grain equivalent tonnes, i.e., 32.3% of domestic needs, were estimated by this report, although the deficit is primarily borne by the most at-risk households. The impact of this drop in vegetable production has affected the quality and balance of food, which is becoming less and less

¹⁰ IPC (2017); WHO and UNICEF (2017)

¹¹ Burundi Institute of Statistics and Economic Studies and ICF International (2017)

¹² Burundi Institute of Statistics and Economic Studies and ICF International (2017)

diversified, which opens the door to malnutrition. Thus, we have seen very high rates of chronic malnutrition.

Epidemiological profile and evolution of health-related policies

In Burundi, the health situation is worrisome. It is characterized by the predominance of many communicable and non-communicable diseases. According to annual statistics for 2009, the diseases that are the primary causes of morbidity are malaria, acute respiratory infections, diarrhoea, malnutrition, HIV/AIDS, and tuberculosis. Many risk factors related to living conditions, more specifically related to hygiene, cleanliness, food, and the environment, contribute to increases of morbidity among the population. At-risk groups such as pregnant women, children, and orphans are particularly affected. This situation is made worse by the low level of social protection of the population vis-à-vis the risk of disease.

Primary causes of morbidity and mortality

Diarrhoeal diseases

These are the third-leading cause of morbidity among children under five years of age, with a rate of 9% according to 2009 annual statistics. Twenty-five percent of children under five years of age had diarrhoea during the two weeks preceding the 2010 DHS. These diseases, to a large extent, consist of helminthiases, typhoid fever, amoebiasis, and food poisoning commonly referred to as ‘dirty hand diseases.’ Lack of cleanliness and hygiene, increased shortages of potable water, and deficiency of sewage disposal systems to a large extent account for the high prevalence of diarrhoeal diseases.

Malnutrition

Chronic malnutrition is a serious problem in Burundi. According to the 2010 DHS, 58% of children under five years of age suffered from chronic malnutrition, 29% in its severe form. In contrast, acute malnutrition was below the alarm threshold defined by the WHO (serious malnutrition greater than 10%) in Burundi, and the 2010 DHS reports a rate of 6%. Weight insufficiency in the survey provinces was still high (greater than 30%), and according to the 2010 DHS it is 29%. In the six provinces surveyed, the prevalence rates were in excess of 55%, including two that were beyond 65% (Kirundo and Muyinga). This situation is due to a set of factors, including the mother’s educational level, recurring nutrition deficits, micronutrient deficiencies, and inappropriate feeding practices for young children, with a maternal breastfeeding initiation rate within the first 24 hours of only 74% and an exclusive breastfeeding rate estimated at 69%. The current intervention strategy is integrated treatment for malnutrition at health facilities and community level.

Problem or challenge

Evaluation of the first National Health Development Plan (2006–2010) and the analysis of the sector revealed a significant improvement in certain indicators, in particular a reduction in infant-juvenile mortality, disease control, and the availability and use of maternal and infant health services. Results of the 2010 DHS show the relevance of certain reforms undertaken during the

previous period, in particular those related to district health policy and free healthcare for pregnant women and children under five years of age, supported by performance-based financing. In addition, the merger of two ministries (Public Health and AIDS Control) and the implementation of a health partners' collaborative framework for the sector represent a relevant initiative for revitalizing the health system through an effective partnership for health development. However, many challenges remain, in particular reducing maternal mortality (866 per 100,000 live births), infant mortality (59 per 1,000) and infant-juvenile mortality (96 per 1,000 live births), and reducing morbidity and mortality related to communicable and non-communicable diseases.

How the policy intends to overcome the challenge

During the next five years, the Ministry of Public Health and AIDS Control is committed to increasing its leadership and directing the sector based on decentralization, results-oriented management, multi-sector collaboration, and a partnership based on the Paris Declaration to improve the quality of life in Burundi.

To address the significant shortfalls in human and material resources and the mobilization capabilities of government funds, foreign aid, and the contribution capacity of the private sector and households, the priorities targeted for implementation of the National Health Development Plan 2011–2015 were:

- improvement of mother and child health;
- fighting communicable and non-communicable diseases;
- strengthening the fight against HIV/AIDS through a multi-sector approach;
- strengthening actions to fight malnutrition;
- increasing demand for healthcare;
- strengthening the health system through strategic orientations piloted around seven pillars (services, human resources, health products and medication, financing, health information, evaluation, and leadership and governance);
- strengthening and perpetuating performance-based financing related to free healthcare; and
- contribution to controlling demographic growth.

4.2.3. Burundi Humanitarian Response Plan (2019)¹³

Sections relevant to food safety

Part II: Operational response plans: water, hygiene, and sanitation: Context and needs analysis. To date, the country still faces challenges related to access to safe drinking water as well as outdated or non-existent sanitation and hygiene systems. Owing to population displacements, climate-related disasters, and the government's low level of investment in the implementation of

¹³https://www.humanitarianresponse.info/sites/www.humanitarianresponse.info/files/documents/files/2019_hrp_burundi_fr.pdf

sustainable solutions owing to a lack of financial resources, the Burundian population is exposed to the risk of epidemics and malnutrition, which directly affect health. For example, water-borne diseases such as diarrhoea, an important factor in child mortality, affect more than 20% of children under five years of age and increase the risk of malnutrition.

Problem or challenge

While the productivity of the 2018 agricultural seasons has increased compared to 2017, some 1.72 million people, or 15% of the population, are in phase 3 (crisis) and phase 4 (emergency) of food insecurity. This figure, which is 30% lower than that of the previous year, can be explained, among other things, by an improvement in agricultural production, but also by the absence of epidemics during most of 2018 and the sharp decline in malaria prevalence. Food insecurity is mainly concentrated in the eastern and northeastern provinces of the country and in the coastal regions of Lake Tanganyika. These areas have been affected by delayed and/or excess rainfall resulting in major river flooding, erosion, and landslides. The torrential rains have also caused physiological disruption to beans, a staple crop that is very sensitive to excess water. Food insecurity is also linked to poor economic opportunities and agricultural production that remains in deficit due to population growth. Animal and plant health threats such as peste des petits ruminants and fall armyworm also contribute to food insecurity. Malnutrition affects boys more than girls. A survey revealed that 5% of boys under five years of age were acutely malnourished compared to 4.1% of girls. The causes of malnutrition in Burundi are multiple and complex. It arises in a context of extreme poverty, sub-optimal care practices, insufficient food and micronutrient intake, lack of access to drinking water, and poor hygiene practices. In 2019, humanitarian partners estimated that 183,000 acutely malnourished or at-risk children under five years of age and pregnant and/or lactating women would require humanitarian assistance.

How the policy intends to overcome the challenge

In times of outbreaks of water, sanitation, and hygiene-related diseases and/or natural disasters, sector partners will provide emergency services to meet the vital needs of populations, thereby reducing mortality and morbidity. To reduce the vulnerability of host households and communities in communes with large numbers of internally displaced persons or returnees, the sector will provide, to the extent possible, durable solutions to gradually improve access to water and sanitation facilities, while promoting good hygiene practices. Some 515 women and men members of 103 management and maintenance committees will be trained to ensure the sustainability of the actions undertaken and to promote community empowerment.

4.2.4. USAID Office of Food for Peace Food Security Country Framework for Burundi, 2014–2019

Sections relevant to food safety

Globally, the objectives of the USAID Office of Food for Peace development and food assistance programs are to target the underlying causes of hunger and malnutrition, reduce chronic malnutrition among children under five years of age, improve the nutritional status of pregnant and lactating women, increase and diversify household income, and strengthen and

diversify agricultural production and productivity.¹⁴ The definition of food security used in the Food Security Country Framework focuses on three distinct but interrelated elements, all of which are essential to achieving food security: (i) food availability: having sufficient quantities of food from household production, other domestic output, commercial imports, or food assistance; (ii) food access: having adequate resources to obtain appropriate foods for a nutritious diet, which depends on available income, distribution of income in the household and food prices; and (iii) food utilization or consumption: proper biological use of food, requiring a diet with sufficient energy and essential nutrients; potable water and adequate sanitation; knowledge of food storage, processing, basic nutrition and childcare and illness management.

Health and nutrition

The disease burden in Burundi is dominated by infectious and communicable diseases. Respiratory tract infections, malaria, and waterborne diseases remain the main causes of death in children under five years of age. While many health indicators are alarming, health-related behaviour and services are improving, with increased antenatal consultations, increased vaccination coverage, and drastic reduction of the incidence of acute malnutrition.

How the policy intends to overcome the challenge

With the overall goal of reducing chronic malnutrition and food insecurity among vulnerable households, the USAID program set up the following priorities and activities:

Priority 1: To reduce chronic malnutrition among children under five years of age. Activities: Prevent chronic malnutrition in children under two years of age; pregnant and lactating women and children seek preventive care and treatment for illness; promote healthy family size; increase use of potable water and sanitation infrastructure.

Priority 2: To increase household food availability and access through increased productivity. Activities: Households increase and diversify crop and livestock production through improved productivity.

Priority 3: To increase household incomes to improve household diet diversity. Activities: Households increase income generated through improved market linkages and off-farm activities; households increase production and consumption of micronutrient-rich foods; design and implement a social behaviour change communication strategy to encourage diet diversity and improved nutritional outcomes.

¹⁴ USAID (2013).

5. Priorities

Inconsistency of relevant laws and regulations, lack of quality control, and risk to the health of consumers are the top three food safety issues in Burundi affecting informally marketed animal-source food, fruits, and vegetables (see the expert opinions in Appendices 1 and 2). The sale of prohibited drinks and contaminated meat in informal markets, especially in poor neighborhoods, is frequently reported in the media.

Poor hygienic conditions and foodborne diseases are often the main source of the food safety problem, and it is difficult to accurately estimate the number of people affected, although it is thought to be high. The non-application of sanitary and phytosanitary measures and relevant laws and regulations is the biggest food safety governance challenge that hinders progress on food safety in the informal market.

Industrial policy and its implementation strategy (under development) to improve food safety are yet to be ratified and promulgated; it is necessary to finalize, ratify, promulgate, and implement them. The same applies to the national quality policy and its implementation strategy.

6. Conclusion

Food safety is an important component of population health and the country's development. It is gaining momentum in developing countries to alleviate the disease burden which has long been undermining their economies. In Burundi, the food safety control system is improving with new laws and regulations. However, the main focus is still geared towards food security and malnutrition.

There are several agencies involved in food safety in Burundi; these include the Burundi Bureau of Standards and Quality Control, the National Centre of Food Technology, Burundi Institute of Agronomic Sciences, and the Faculty of Agronomy and Bioengineering of the University of Burundi. The coordinating agency is the multi-sectoral platform for food security and nutrition, hosted by the Office of the President. It has a strategic plan as a tool that provides overall direction and essential elements to guide stakeholders in planning actions and interventions. At the level of each sector, a detailed implementation plan is needed, integrating the tasks to be accomplished at predefined intervals (e.g., monthly or quarterly).

Laboratories for food safety control exist in Burundi. However, they face several challenges including insufficient and poorly maintained equipment, insufficient quality management, lack of chemicals and other consumables, difficulties in using certain laboratory devices, insufficient qualified technical staff, and lack of chemical waste treatment services.

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Appendix 1: Expert estimates of the causes of foodborne diseases in animal-source foods, fruits, and vegetables

| Causes of foodborne diseases | Animal-source foods | | | Fruits and vegetables | | |
|--------------------------------------|---------------------|----------------|-----------------------------------|-----------------------|----------------|-----------------------------------|
| | Present (tick) | Rank (1, 2, 3) | Modalities of testing (see below) | Present | Rank (1, 2, 3) | Modalities of testing (see below) |
| Adulteration | x | 3 | E | X | 3 | E |
| Pathogenic bacteria of animal origin | x | 2 | R | X | 2 | R |
| Pathogenic bacteria of human origin | x | 2 | R | X | 1 | R |
| Foodborne viruses | x | 3 | N | | | N |
| Parasites | x | 1 | R | X | 1 | R |
| Mycotoxins | x | 2 | N | X | 2 | N |
| Food additives | x | 3 | E | X | 3 | E |
| Pesticide residues | x | 3 | E | X | 3 | E |
| Heavy metals | | | E | X | 3 | E |
| Chemicals | x | 2 | E | X | 2 | E |
| Antibiotic residues | x | 2 | N | | | |
| Hormones | x | 3 | N | | | |
| Radioactive contaminants | | | | X | 3 | N |
| Genetically modified organisms | x | 3 | N | X | 3 | N |
| Deliberate poisoning | x | 3 | N | | 3 | N |

Rank

1: most important; 2: important; 3: less important

Modalities of testing

R: Regular testing. Products are tested regularly for this.

E: Episodic testing. Occasional surveys or investigation of problems.

N: No testing. This problem is not tested for.

Appendix 2: Expert estimates of the most important foodborne hazards in animal-source foods, fruits, and vegetables

| Foodborne hazards | Importance (tick if important in your country) | Evidence |
|-------------------------------------------------------|------------------------------------------------|------------------|
| <i>Campylobacter</i> | | |
| Enteropathogenic and enterotoxigenic <i>E. coli</i> | x | Hospital records |
| <i>Cryptosporidium parvum</i> | | |
| <i>Shigella</i> | x | Hospital records |
| <i>Listeria</i> | x | Hospital records |
| <i>Brucella</i> | x | Hospital records |
| Non-typhoidal <i>Salmonella</i> spp. | x | Hospital records |
| <i>Vibrio</i> | x | Hospital records |
| <i>Toxoplasma gondii</i> | x | Hospital records |
| <i>Yersinia enterocolitica</i> * | | |
| Norovirus | | |
| Hepatitis A | x | Hospital records |
| <i>Mycobacteria bovis; Mycobacterium tuberculosis</i> | x | Hospital records |
| <i>Giardia</i> | x | Hospital records |
| <i>Ascaris</i> spp. | x | Hospital records |
| Cysticercosis | x | |
| <i>Trichinella spiralis</i> | | |
| <i>Entamoeba histolytica</i> | x | Hospital records |
| Pesticide residues | | |
| Antimicrobial residues | | |
| Genetically modified organisms | | |
| Aflatoxin | | |

Evidence

Indicate the basis for the estimate of importance (e.g., surveys, one-off studies, expert opinion, guess)

Appendix 3: Origin of the pathologies

| Food group | Food | Pathogens found above permissible levels |
|-------------------------------------------|---------------------------|----------------------------------------------------------------------------------------------------------------|
| Meat, fish, poultry, and derived products | Fresh meat | <i>Salmonella</i> spp., <i>Listeria monocytogenes</i> |
| | Mince meat balls, sausage | <i>Clostridium perfringens</i> , <i>Bacillus cereus</i> |
| | Poultry | <i>Salmonella</i> spp., <i>Listeria monocytogenes</i> , <i>Campylobacter jejuni</i> |
| | Fish | <i>Vibrio parahaemolyticus</i> , <i>Aeromonas hydrophila</i> |
| Milk and dairy products | Milk ¹⁵ | <i>Salmonella</i> spp., <i>Listeria monocytogenes</i> , <i>Brucella abortus</i> |
| | Cheese | <i>Salmonella</i> spp., <i>Listeria monocytogenes</i> , <i>Staphylococcus aureus</i> , <i>Brucella abortus</i> |
| Cereals and derived products | Wheat flour ¹⁶ | <i>Aspergillus flavus</i> |
| | Maize flour | <i>Aspergillus flavus</i> |
| Fruits and vegetables | Fruits | <i>Vibrio cholerae</i> , <i>Staphylococcus aureus</i> , <i>Salmonella</i> spp., <i>Shigella dysenteriae</i> |
| | Vegetables | <i>Vibrio cholerae</i> , <i>Salmonella</i> spp., <i>Shigella dysenteriae</i> |
| Home-made drinks | Urwarwa | <i>Vibrio cholerae</i> , <i>Salmonella</i> spp., <i>Shigella dysenteriae</i> |
| | Isongo | <i>Vibrio cholerae</i> , <i>Salmonella</i> spp., <i>Shigella dysenteriae</i> |

¹⁵ All the pathogens found in milk are heat-sensitive, suggesting that pasteurization was not properly conducted.

¹⁶ The occurrence of *Aspergillus flavus* in maize and wheat flour poses the risk of acute or chronic aflatoxicosis.