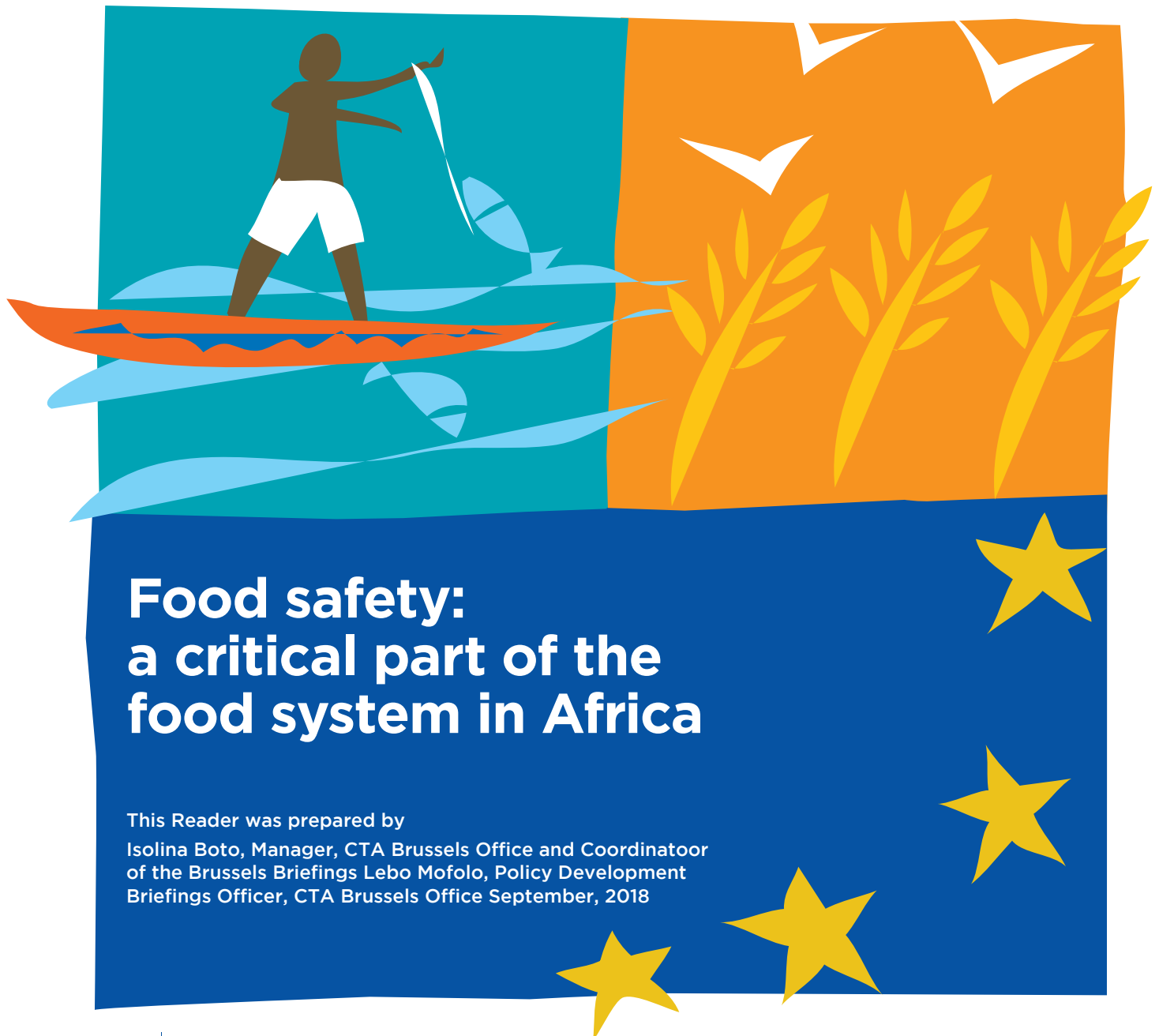




BRUSSELS RURAL DEVELOPMENT BRIEFINGS

A SERIES OF MEETINGS ON ACP-EU POLICY DEVELOPMENT ISSUES



Food safety: a critical part of the food system in Africa

This Reader was prepared by
Isolina Boto, Manager, CTA Brussels Office and Coordinator
of the Brussels Briefings Lebo Mofolo, Policy Development
Briefings Officer, CTA Brussels Office September, 2018



Briefing n. 52 Food safety: a critical part of the food system in Africa

Brussels, 19 September 2018

This Reader was prepared by

Isolina Boto, Manager, CTA Brussels
Office and Coordinator of the
Brussels Briefings

Lebo Mofolo, Policy Development
Briefings Officer, CTA Brussels Office

The information in this document
was compiled as background reading
material for the 52nd Brussels
Briefing on Food safety: a critical
part of the food system in Africa.

The Reader and most of the
resources are available at:
<http://brusselsbriefings.net>

Table of Contents

1. Context	4
2. Understanding food safety	5
2.1 Policy engagement in food safety	5
2.2 Food safety: a component of a complex food system	7
2.3 Food safety: a public health priority	9
2.4. Food safety and nutrition.....	10
2.5. Food Safety: Management of Hazards and Risks	11
2.6. The complexity of food safety standards.....	19
3. Food safety in the African context	21
3.1. Foodborne diseases in Africa	21
3.2. Urbanisation and Food Safety Implications	23
3.3 Street food markets as a source of foodborne illness	24
3.4. Regional Markets and Food Safety	26
4. New technologies in support of food safety	28
5. The way forward.....	30
 Annex	
Glossary	33
Acronyms	38
Resources	39
Websites	44
Endnotes	45



1. Context

Food safety is linked, directly or indirectly, to the achievement of many of the Sustainable Development Goals (SDGs), especially those pertaining to ending hunger and poverty, and promoting good health and well-being. Food and nutritional security is realized only when essential elements of a healthy diet are safe to eat.

People have the right to expect their food to be safe, of good quality and suitable for consumption.¹ Despite this, food continues to be a leading source of illness and disease. It is the prevention, reduction and management of these foodborne illnesses or diseases, which has led to the emergence food safety as a pressing global issue.

The integration and consolidation of agricultural and food industries, new dietary habits, the globalization of the food trade and human movements are modifying the patterns of food production, distribution and consumption. In one hand, this allows the consumers to access greater variety of food available at all seasons and the exporting countries to earn foreign exchange. As the world's population grows, the intensification and industrialization of agriculture and animal production to meet increasing demand for food creates both opportunities and challenges for food safety. Globalization has triggered growing consumer demand for a wider variety of foods, resulting in an increasingly complex and longer global food chain. Climate change is also predicted to impact food safety, where temperature changes modify food safety risks associated with food production, storage and distribution.

The World Health Organization (WHO) estimated that globally, there were

up to 600 million foodborne illnesses and resulting in 420,000 deaths in 2010, making foodborne diseases (FDB) a major cause of morbidity and mortality.² Understanding the full prevalence of foodborne diseases worldwide is a challenge, as these types of illnesses are frequently underreported and underdiagnosed.

Serious outbreaks of foodborne disease have been documented on every continent in the past decade, illustrating the public health and social significance of these diseases.

Foodborne diseases not only adversely affect people's health and well-being, but also have negative economic consequences for individuals, families, communities, businesses and countries. These diseases impose a substantial burden on health-care systems, trade and tourism, markedly reduce economic productivity and threaten livelihood. Yet, the full spectrum of the burden of foodborne diseases has never been quantified on a global basis, since foodborne illnesses are often under-reported. Policy makers at the local, national and international levels need science-based, reliable estimates on the burden of foodborne disease to inform their decisions and mobilise resources.³

Other key challenges include the health impact of antimicrobial resistance in foodborne pathogens; the risks posed by newly identified pathogenic microorganisms and chemical substances in the food supply; the impact of new technologies in food production and processing, including genetic engineering and nanotechnology, on consumer safety. Also, changes in animal food production and animal husbandry have an impact on the emergence and spread of diseases of zoonotic origin.⁴

Food can become contaminated at any point of production and distribution, and the primary responsibility lies with food producers. Yet a large proportion of foodborne disease incidents are caused by foods improperly prepared or mishandled at home, in food service establishments or markets. Not all food handlers and consumers understand the roles they must play, such as adopting basic hygienic practices when buying, selling and preparing food to protect their health and that of the wider community. Millions of smallholder farmers, many of them women, supply the rapidly growing markets for livestock and fish products in Africa. In sub Saharan Africa, more than 80% of animal products are sold through informal markets, which lack structured sanitary inspection.

Food safety and food control systems need to adapt to today's food production and distribution practices, moving their focus gradually from the end-product testing to the process control throughout the food chain. Education and training of food safety workers need to take these challenges and developments into account.

These challenges put greater responsibility on governments, food producers and handlers to ensure food safety. Facilitating global prevention, detection and response to public health threats associated with unsafe food is a priority across Africa. Ensuring consumer trust in their authorities and confidence in the safe food supply is a benefit for all actors of the value chain.

To achieve food safety, cross-sectoral collaboration is needed between the public health and other sectors —particularly the agricultural and animal health sectors and emphasis on education, consumer's awareness, research and technology.

2. Understanding food safety

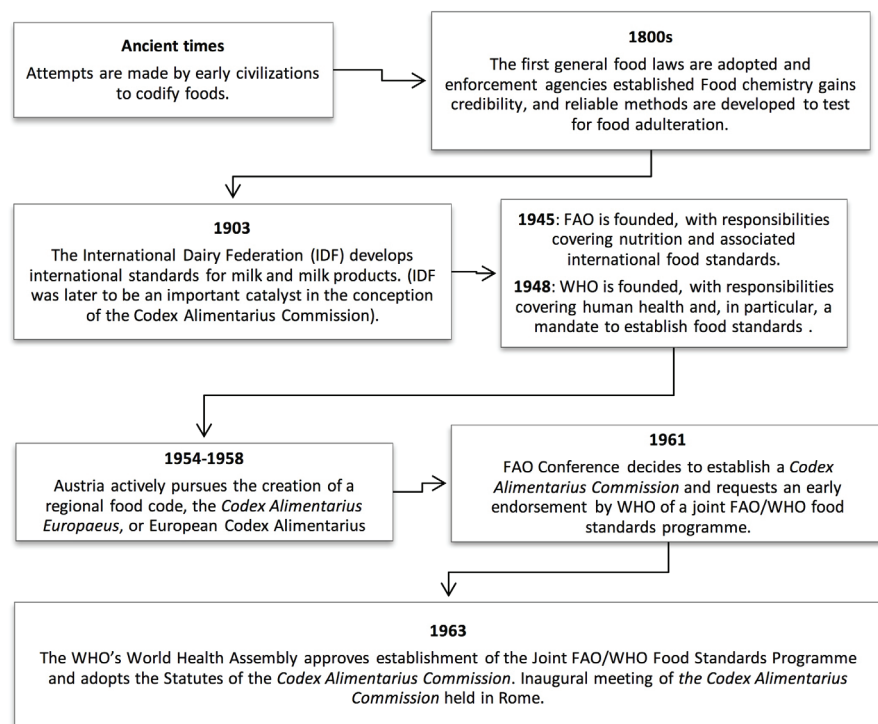
As food became more commoditised, there was the subsequent proliferation of food quality and safety rules, standards and other measures at national level and within the private sector, which often conflicted or duplicated each other to the detriment of consumers, food producers, public authorities and the growing trade in food. Part of this issue was resolved through the establishment of international organisations such as the Food and Agriculture Organization and the World Health Organization, who were respectively given

responsibility for certain broad aspects of food quality and human health and went on to establish the Codex Alimentarius Commission. Together with the World Trade Organization and the International Standards Organization, these institutions have successfully promoted better harmonisation of standards and rules regarding food quality and safety at the international level.

Food safety is commonly understood to be concerned with preventing harm to human health through food, specifically due to “hazards, whether chronic or acute, that may make food injurious to the health of the consumer.”⁶ Other sources define food safety as “an umbrella term that encompasses many facets of handling, preparation, and storage of food to prevent illness and injury. Included under the umbrella are chemical, microphysical and microbiological aspects of food safety. Pathogenic bacteria, parasites, viruses, fungus and toxins produced by microorganisms are all possible contaminants of food and impact on food safety.”⁷

Although the responsibility for ensuring food safety lies primarily with the producer or manufacturer of food, the consumer and more importantly the public institutions play a key role. As the demand for food continues to grow, and the production or supply of food involves longer value chains, including those that cross borders, the responsibility for assuring food safety increasingly relies policymakers and especially on national or regional regulators. Beyond the question of responsibilities, effective food safety depends on the execution of many interlinked activities, in the domains of science, law, communications, logistics, and other technical fields.

Figure: Milestones in the evolution of food standards



Source: Adapted from “Understanding Codex - Codex Alimentarius” (2016)⁵

2.1. Policy engagement in food safety

Food safety policy refers to the structures put in place to ensure that food is handled, prepared and stored in a way that minimizes contamination risks. It is a pertinent global issue as foodborne illnesses account for a high number of casualties. Food hygiene regulations aim to prevent food poisoning cases. They involve



equipment and surface sanitizing, high personal hygiene levels, effective pest control and proper storage and heating. While there are general guidelines applied across the global divide, some aspects set apart regional regulations in different locations.

Industry stakeholders from the growing, processing and foodservice/retail sectors are using cold chain systems, Hazard Analysis and Critical Control Points (HACCP) and other food safety management systems (FSMSs) such as the ISO 22000 as models to achieve food safety to enhance trade opportunities in international markets. Advanced knowledge of food hazards has resulted in new regulations, which includes mandatory HACCP system implementation in processing plants in several countries. Food laws aim to protect consumers' interests, their well-being, and to a degree, facilitate fair trade.

The Codex Alimentarius Commission (Codex) was founded by the UN Food and Agriculture Organization **FAO** and the **World Health Organization** in 1963, with the mandate to develop international food standards in order to protect the health of consumers and ensure fair practices in food trade. Members of the World Trade Organization (WTO) recognize Codex Alimentarius standards as the basic standard upon which national measures will be judged.⁸

The Codex Alimentarius is a collection of food standards, codes of practice, guidelines and other related texts. Codex standards represent agreements between member countries and are not therefore intended to lead to certification programmes. However, Codex standards have become global reference points for consumers, food industries, national food agencies and the international food trade in general. Along with standards for

separate types of products, the Codex contains general standards for regulating issues of labelling, food hygiene, food additives, contaminants, pesticide residues, food safety research procedures and biotechnology. The CAC enables countries to develop their food safety regulations in line with international standards.

WHO is the global health authority for the provision of independent, international food safety risk assessments. This work is undertaken in collaboration with FAO, through the organization of joint expert meetings. Continuous updates of general risk assessment principles and methods are important to take into account new scientific developments.

The **World Health Organisation (WHO) Food Safety Programme** supports Member States to develop, implement, monitor and evaluate policies, strategies and programmes to address all food safety and nutrition problems, towards attaining the highest possible level of food safety and optimal nutrition.

The International Food Safety Authorities Network (INFOSAN) was developed by WHO and the FAO to rapidly share information during food safety emergencies.⁹

In order to help the international community prevent and respond to acute public health risks that have the potential to cross borders and threaten people worldwide, the International Health Regulations (IHR 2005) entered into force in 2007. The IHR define the rights and obligations of countries to report public health events to WHO and establish a number of procedures that WHO must follow in its work to uphold global public health security. Some food safety events will constitute public health emergencies of international concern, resulting in the need for

coordination and collaboration among established networks in the area of food safety and foodborne zoonoses—most notably the INFOSAN, the Global Early Warning System for Major Animal Diseases, including Zoonoses (GLEWS) and the network of National IHR Focal Points.

Access to reliable and current information on the incidence of foodborne disease and the occurrence of food contamination as well as a better understanding of the health burden of diseases related to foodborne risks are critical to enable policy-makers as well as other food safety stakeholders to appropriately prioritize and allocate resources to foodborne disease prevention and control efforts; to monitor and evaluate the effectiveness of measures taken; and to quantify the burden in monetary terms.

WHO, in collaboration with FAO, provides the scientific advice as the evidence base for Codex standards, as well as guidelines, recommendations and policy options. WHO has the authority, the reach and the convening power in the field of global public health to undertake this essential function. Scientific advice has been provided for decades through long-standing and well-established mechanisms—namely, the Joint FAO/WHO Expert Committee on Food Additives (JECFA), the Joint FAO/WHO Meeting on Pesticide Residues (JMPR) and the Joint FAO/WHO Expert Meeting on Microbiological Risk Assessment (JEMRA).

WHO establishes international standards and recommendations and promote their implementation and importance in public health and establishes new approaches to systematically collect, analyse and interpret data and other information to better guide risk analysis and underpin policy decisions.¹⁰

Food safety: a critical part of the food system in Africa

Regulators are making strides to improve food safety measures. In the U.S., the Food and Drug Administration (FDA) and the Department of Agriculture (USDA) collaborated efforts to implement the Food Safety and Modernization Act (FSMA), which increases controls and preventative measures on food imports. Further efforts to ensure the safety of food exports are implemented in the Foreign Suppliers Verification Programs (FSVP), with compliance dates that span as far as July 2020, according to the FDA.

The basic principles for the **EU's food safety policy** are defined in the EU's General Food Law, adopted in 2002. Its general objectives are to facilitate the free trading of food across all EU countries by ensuring the same high level of consumer protection in all Member States. The EU food law covers all parts of the food chain from animal feed and food production to processing, storage, transport, import and export, as well as retail sales. The EU food law also establishes the principles for risk analysis. These stipulate how when and by whom scientific and technical assessments should be carried out in order to ensure that humans, animals and the environment are properly protected. This common approach ensures that minimum standards apply throughout the EU. It helps EU countries to prevent and control diseases, and to tackle food and feed safety risks in a coordinated, efficient and cost-effective manner.¹¹

The **implementation** of this integrated Food Safety policy in the EU¹² involves various actions, namely:

- to assure **effective control systems** and evaluate **compliance with EU standards** in the food safety and quality, animal health, animal welfare, animal nutrition and plant health sectors within the EU and in third countries in relation to their exports to the EU;

- to manage **international relations** with third countries and international organisations concerning food safety, animal health, animal welfare, animal nutrition and plant health;
- to manage **relations with the European Food Safety Authority (EFSA)** and ensure science-based **risk management**.

To succeed in international trade, and in particular trade to Europe, African exporters need to have a very good knowledge of these regulations and the capacity to implement them, delivering the quality required by the targeted markets. Failing to do that can result in the loss of valuable markets.

Food safety-related legislation is continually under review as it needs to reflect new knowledge, technical innovation and changes in the pattern of the distribution. As a result, national regulatory authorities throughout the world are in a constant catch-up mode. Similarly, international food safety standard-setting bodies look to address current issues and to develop guidelines on systems and methods that will help streamline food safety best practices within and between nations.

The European Union (EU) implements the Trade Control and Expert System (TRACES) for food traceability and risk-management functions, which can trace traded goods throughout the production chain for animals, plants or animal-based products. The rapid early warning system (RASFF) is in place to react quickly to stem outbreaks and foodborne illness, notes the **EU**.

Now that most African countries are embracing international trade, they are paying a lot more attention to food safety. The **African Union (AU)** is formulating a promising project

towards a common food standards framework focusing on minimizing public health risks and getting consumers to trust the local food system.

2.2. Food safety: a component of a complex food system

Food safety is embedded in the broader food system. The High Level Task Force on Global Food and Nutrition Security (HLTF) defines a food system as “a system that embraces all the elements (environment, people, inputs, processes, infrastructure, institutions, markets and trade) and activities that relate to the production, processing, distribution and marketing, preparation and consumption of food and the outputs of these activities, including socio-economic and environmental outcomes. A sustainable food system is a food system that delivers food and nutrition security for all in such a way that the economic, social and environmental bases to generate food security and nutrition for future generations are not compromised.”¹³

Food systems can therefore be applied to different levels – local, national, regional, global – with distinct characteristics.

Food safety and its related processes therefore underlies the integrity of the food system, by ensuring first and foremost that the food does not harm its intended beneficiary, the consumer. Other beneficiaries of the food system such as producers, retailers, processors etc. also depend on food safety as a framework of assurance that food is safe for consumption, and is therefore an important factor in their business operations. Finally, governments also have an interest in food safety insofar as it contributes to food security, by removing harmful food from markets,



and as a public policy tool to improve the health outcomes of a country and reducing the costs associated with illness and morbidity. Apart from the benefits to the food system, regulation of food safety by governments can also be an instrument to enhance the economic performance of a country, for example, in terms of tourism attractiveness, and food and agriculture related foreign direct investment.

Other concerns of stakeholders in the food system may include food quality, food fraud and food defence. Together with food safety, these are all essential – and interrelated – components of the governance of food system. Food safety and food quality are closely related, but the latter is concerned with other attributes, which may be positive or negative but do not directly constitute a health risk to the consumer. These can range from spoilage, contamination with dirt, discoloration, off-odours on the negative side, or positive ones such

as origin, colour, flavour, texture and processing method on the positive side.¹⁴

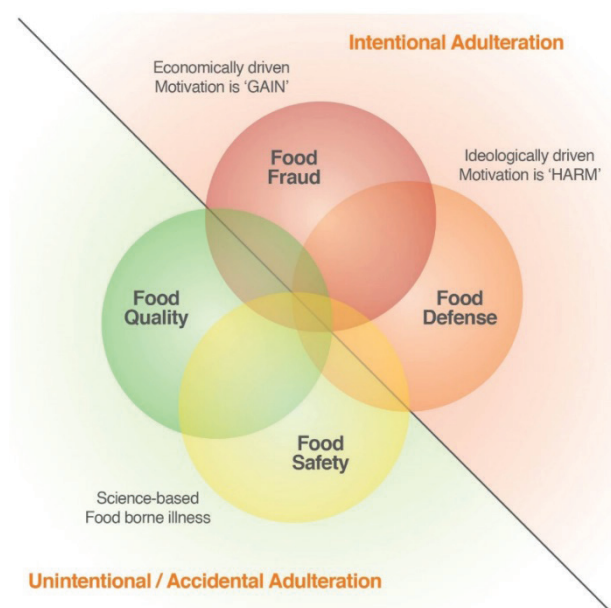
Due to the links between the two issues, food safety and food quality are often addressed under a common broad framework at national, regional and global levels. For example the EU's General Food Law Regulation lays down the general principles and requirements of food law across the member states, and similarly the *Codex Alimentarius*.

Despite the frequent reference to food fraud, it remains a rather general term to refer to the “intentional adulteration of food for financial gain. This can include deliberate substitution, dilution, counterfeiting, or misrepresentation of food, ingredients or packaging; or even false or misleading statements made about a product.”¹⁵ The European Union for its part does not have a harmonized definition of food fraud, but does seek to combat fraud (fraudulent activity) within its food

system. “It is broadly accepted that food fraud covers cases where there is a violation of EU food law, which is committed intentionally to pursue an economic or financial gain through consumer deception.”¹⁶ According to a recent brief by the global consultancy PwC, where consumer safety is the most important objective of food fraud prevention, “there is also a financial impact. Food fraud costs the global food industry an estimated US\$40 billion each year. A single incident can permanently destroy a valuable brand, cause long-term industry-wide losses, close off export markets and damage trust in public institutions.”¹⁷

Lastly, also closely related to food safety is the subject of nutrition. As the contribution of food nutrition to human health has become better understood, so also does the risk posed by unsafe food, which can be a significant causal factor for malnutrition.¹⁸

Figure : Mapping Control Points for Food Systems



Source: GFSI Position on Mitigating Public Health Risk of Food Fraud (2014)

2.3. Food safety: a public health priority

What is a Foodborne Disease?

There are various definitions of FBD. The WHO FERG¹⁹ report defines FBD as “a disease commonly transmitted through ingested food. FBDs comprise a broad group of illnesses, and may be caused by microbial pathogens, parasites, chemical contaminants and biotoxins” (WHO 2015). FERG follows the Codex Alimentarius Commission (CAC) definition of food as “any substance, whether processed, semi-processed or raw, which is intended for human consumption, and includes drink, chewing gum and any substance which has been used in the manufacture, preparation or treatment of food but does not include cosmetics or tobacco or substances used only as drugs”. According to the CAC, bottled and packaged water, as well as other drinks, are foods.²⁰

Foodborne diseases encompass a wide spectrum of illnesses and are a growing public health problem worldwide. They are the result of ingestion of foodstuffs contaminated with microorganisms or chemicals. The contamination of food may occur at any stage in the process from food production to consumption (“farm to fork”) and can result from environmental contamination, including pollution of water, soil or air.

The most common clinical presentation of foodborne disease takes the form of gastrointestinal symptoms; however, such diseases can also have neurological, gynaecological, immunological and other symptoms. Multiorgan failure and even cancer may result from the ingestion of contaminated foodstuffs, thus representing a considerable

burden of disability as well as mortality (WHO).

Globally, much of the known burden of foodborne disease comes from consumption of fresh, perishable foods sold in informal markets of developing countries, where a lack of storage and cooling facilities can jeopardise food safety.²¹ Micronutrient-dense foods such as vegetables, fruit, meat and dairy are at particular risk of being contaminated by micro-organisms associated with foodborne diseases. Gastrointestinal illnesses are the most common manifestation of foodborne disease, and are particularly associated with undercooked meat, eggs, fish, fresh produce and dairy products. Diarrhoeal diseases are responsible for causing 230,000 deaths of which 96,000 are children under five years.²²

Foodborne diseases are an important cause of morbidity and mortality, and a significant impediment to socioeconomic development worldwide, but the full extent and burden of unsafe food, and especially the burden arising from chemical and parasitic contaminants, has been unknown. Precise information on the burden of foodborne diseases can adequately inform policy-makers and to allocate appropriate resources for food safety control and intervention efforts.

Food is a sensitive subject in most countries, and often governments will want to guard against anything that can inflict damage on a country's food system, including major incidents of foodborne diseases as well as the nature of their food systems, such as the prevalence of informal food markets. Furthermore, an important balance has to be struck between preventing foodborne diseases in a domestic context, and ensuring compliance with standards and rules that are necessary to access export markets.

Governments have to ensure that often-limited resources are not disproportionately spent on the regulation of cash crops for export at the expense of food crops, thus exposing domestic consumers to greater risks of foodborne illnesses and harm. This balance must also be reflected when it comes to allocating resources to the various ministries that are concerned with foodborne diseases, from its source to its point of impact, thus ensuring that FBD are prevented from “farm to fork”. Government departments responsible for agriculture and public health are most often involved in developing and implementing the measures responsible for the prevention of FBDs. In most cases, these ministries and their related agencies may not have similar budgets or capacity in terms of trained officials, and risk duplicating tasks and responsibilities. Public health systems can very quickly become overwhelmed during an outbreak of a major foodborne illness, and the effects if handled badly can have major political repercussions.

Considerable damage can also be done to a country's food and agriculture sector, leading to loss of access to markets – both domestic and international – and revenue, particularly where significant volumes of food have to be recalled and destroyed in response to such an outbreak. This can lead to closure of businesses, job losses, a fall in investment into the country, reduction of tourist numbers, damage to the country's image and in some cases, even political instability.

Consumer interest and awareness about the quality and impact of food on health has grown tremendously over the last decades. It has been fuelled by a desire from many consumers to be healthier and avoid the risk of illness, as well as the increased availability of information about food, and in turn, it has led to

Food safety: a critical part of the food system in Africa



pressure on producers to be invest more in preventing food borne illnesses.

Producers have increased responsibilities as the supply chains have become longer and more complex, they face increased competition due to globalisation, and the reputational and financial risk they face is higher than ever before. Smallholder farmers are especially vulnerable and exposed to negative economic repercussions in the event of a major incident of foodborne illnesses – they tend to have fewer resources to enable them to comply with ever complex food safety requirements, and market liberalisation means that they can become displaced by larger and better adapted international producers.¹

Improving food safety implies a number of actions: (i) improving the

hygienic quality of raw foodstuffs; (ii) optimising the use of food processing technologies and hazard analysis and critical control point (HACCP); and (iii) promoting education of all food handlers, including home-based food handlers.

2.4. Food safety and nutrition

Food Safety and Nutrition

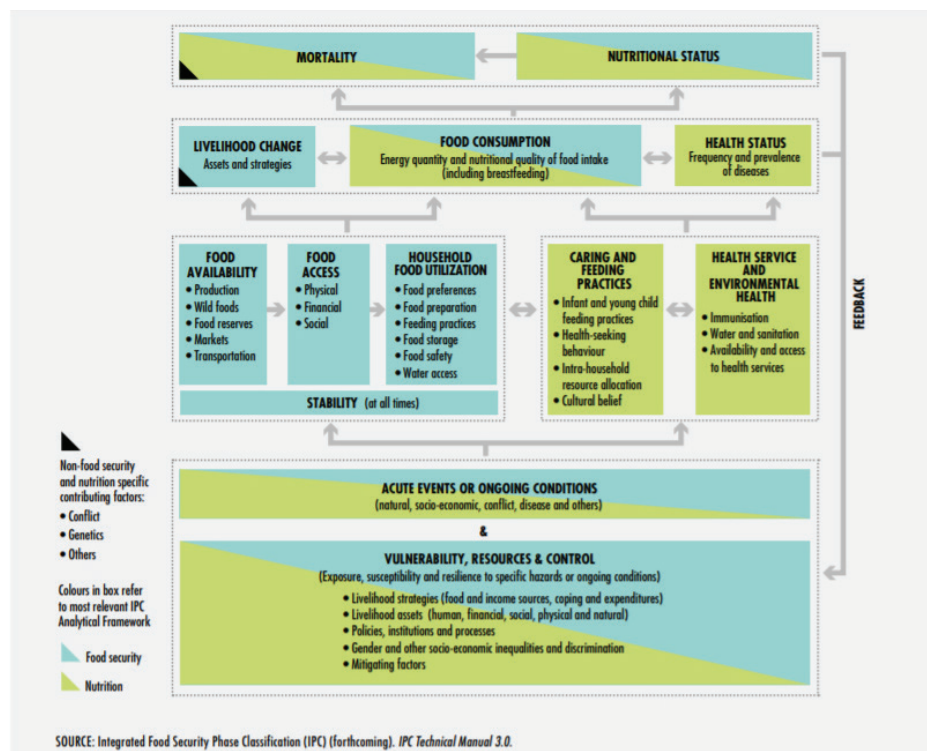
*Global Panel on Agriculture and Food Systems for Nutrition*²⁵

Unsafe food can affect nutrition and health outcomes both directly and indirectly. Infection by foodborne pathogens can result in poor absorption of nutrients from food, particularly of vitamins and minerals, which have an impact on the consumer's nutritional status.²⁶

Undernutrition and associated immune deficiencies can also increase an individual's susceptibility to infection. Foodborne pathogens take advantage of weak immune systems, particularly affecting infants and young children, pregnant women, the elderly, the malnourished and the immunocompromised. Reinforcing each other in this way, the combination of foodborne disease and undernutrition can spiral into a vicious cycle of worsening health, with particular impact on vulnerable early life stages where poor nutritional outcomes can lead to stunted growth, carrying a lifetime of consequences.²⁷ The nutritional impacts of foodborne disease agents that cause diarrhoea have been known for many years. Diarrhoea has a clear effect on weight loss, loss of appetite, loss of key micronutrients, such as zinc and iron, as well as wasting and growth retardation. Some of the physiological mechanisms involved in response to foodborne pathogens may also play a part in overweight and obesity. The chronic inflammatory responses, redistribution of nutrients, inhibited protein synthesis, rising oxidative stress, nutrient malabsorption, impaired immune response and increased nutrient requirements associated with foodborne pathogens have all also been associated with obesity.²⁸

Aflatoxins are a naturally occurring carcinogenic byproduct of common fungi on grains and other crops, particularly maize and groundnuts. They pose a significant public health risk in many tropical developing countries and are also a barrier to the growth of domestic and international commercial markets for food and feed. In recent years the aflatoxin problem has garnered greatly increased attention from both policy and donor communities around the globe.²⁹

Figure: Links between food security and nutrition, and the underlying causes of food insecurity and malnutrition²⁴



Source: GFSI Position on Mitigating Public Health Risk of Food Fraud (2014)

The Centers for Disease Control and Prevention (CDC) estimates that 4.5 billion people in the developing world are chronically exposed to Aflatoxin (fungal contamination) that affects staple foods like maize (both before and after harvest), this can lead to a variety of cancers and immune disorders. It's estimated that aflatoxin may be a causative agent in up to 30% of liver cancer cases globally each year. Association between aflatoxins and stunting in children; affecting their growth and development. Stunting affects 165 million children under the age of five that is 26% of all children globally.³⁰

2.5. Food Safety: Management of Hazards and Risks

Food safety can be enforced through various means, involving a combination of practices and standards that are applied by various actors along the value chain.

The most universal methods of enforcement of food safety are through a “food safety management system” (FSMS), which according to the FAO and the WHO is a “holistic system of controls that manage food safety in a food business. Includes GHPs, the HACCP system, management policies and traceability/recall systems.”³¹

The European Commission also reflects this definition in the “Commission Notice on the implementation of food safety management systems covering prerequisite programs (PRPs) and procedures based on the HACCP principles, including the facilitation/flexibility of the implementation in certain food businesses (C/2016/4608)”.³²

Sound food safety management systems apply the “farm to fork” (or farm to table) approach, ensuring that food safety is addressed from production to consumption and through each step of the value chain.

This generally involves the identification of a hazard, a risk assessment, the application of a control response (often based on the FSMS protocol or national law) – a process which will repeat itself throughout the various stages of production, processing, distribution and up until the point of consumption. In some instances, an additional check is the lethal processing step – this is the point during processing where methods involving for example chemicals or heat are applied to kill a given hazard. However, this process does not apply to many foods, and hazards can still be introduced after the lethal processing step.

The “farm to fork” approach is important because different hazards are encountered at different stages in the supply chain, and it is therefore important that all actors in a value chain understand that food safety management is also part of their responsibility. Some hazards can only be eliminated at a specific stage, whereas others can, and must, be addressed at various stages of the supply chain.

According to the FAO, “it is impossible to provide adequate protection to the consumer by merely sampling and analysing the final product. The introduction of preventive measures at all stages of the food production and distribution chain, rather than only inspection and rejection at the final stage, makes better economic sense, because unsuitable products can be identified earlier along the chain. The more economic and effective strategy is to

entrust food producers and operators with primary responsibility for food safety and quality. Government regulators are then responsible for auditing performance of the food system through monitoring and surveillance activities and for enforcing legal and regulatory requirements.”³³

Food safety management systems are primarily concerned with food safety at the production, processing and distributions levels, with a view to reducing the risk that food will reach consumers with hazards that could harm them. They are complemented by other approaches which are centred on consumers, and which seek to address food safety concerns arising from consumer activity. In either case, hazards and risks are the building blocks of any approach to deal with food safety, and the methods used within these approaches will differ depending on the resources, objectives, legal framework and other factors relevant within a food system or value chain.

A hazard is a factor or agent which may lead to undesirable effects, whereas, risk refers to the probability that the effect will occur.³⁵ Although the terms hazard and risk are often used interchangeably in public discourse, in the context of food safety management (and other fields concerned with health and safety), the distinction between hazards and risks is an important one.

At the heart of food safety is the understanding of the hazards that lead to food becoming unsafe for human consumption, and the risks of this occurring.

(1) Hazards

Unsafe food contains hazardous agents, or contaminants, that can



make people sick – either immediately or by increasing their risk of chronic disease. Such contaminants can enter food at many different points in the food production process, and can occur naturally or as the result of poor or inadequate production practices. Hazardous agents that are receiving attention from policymakers include microbial pathogens, zoonotic diseases, parasites, mycotoxins, antibiotic drug residues, and pesticide residues. Even genetically modified foods and their potential to contain allergens or toxins not found in conventional foods have begun to receive attention as well in developing countries.³⁶

The food-borne hazards that can cause harm to human health may be biological, chemical or physical in nature. Foodborne illnesses are usually infectious or toxic in nature and caused by bacteria, viruses, parasites or chemical substances entering the body through contaminated food

or water. Foodborne pathogens can cause severe diarrhoea or debilitating infections including meningitis.

Chemical contamination can lead to acute poisoning or long-term diseases, such as cancer. Foodborne diseases may lead to long-lasting disability and death. Examples of unsafe food include uncooked foods of animal origin, fruits and vegetables contaminated with faeces, and raw shellfish containing marine biotoxins.

Bacteria:

- **Salmonella, Campylobacter, and Enterohaemorrhagic Escherichia coli** are among the most common foodborne pathogens that affect millions of people annually – sometimes with severe and fatal outcomes. Symptoms are fever, headache, nausea, vomiting, abdominal pain and diarrhoea. Examples of foods involved in outbreaks of salmonellosis are

eggs, poultry and other products of animal origin. Foodborne cases with *Campylobacter* are mainly caused by raw milk, raw or undercooked poultry and drinking water. *Enterohaemorrhagic Escherichia coli* is associated with unpasteurized milk, undercooked meat and fresh fruits and vegetables.

- **Listeria** infection leads to unplanned abortions in pregnant women or death of newborn babies. Although disease occurrence is relatively low, listeria's severe and sometimes fatal health consequences, particularly among infants, children and the elderly, count them among the most serious foodborne infections. Listeria is found in unpasteurised dairy products and various ready-to-eat foods and can grow at refrigeration temperatures.
- **Vibrio cholerae** infects people through contaminated water or food. Symptoms include abdominal pain, vomiting and profuse watery diarrhoea, which may lead to severe dehydration and possibly death. Rice, vegetables, millet gruel and various types of seafood have been implicated in cholera outbreaks.

Antimicrobials, such as antibiotics, are essential to treat infections caused by bacteria. However, their overuse and misuse in veterinary and human medicine has been linked to the emergence and spread of resistant bacteria, rendering the treatment of infectious diseases ineffective in animals and humans. Resistant bacteria enter the food chain through the animals (e.g. *Salmonella* through chickens). Antimicrobial resistance is one of the main threats to modern medicine.

Figure: The chain of food production and foodborne disease prevention from farm to table.



Source: Centers for Disease Control and Prevention³⁴

Food safety: a critical part of the food system in Africa

i. Viruses:

Norovirus infections are characterized by nausea, explosive vomiting, watery diarrhoea and abdominal pain. Hepatitis A virus can cause long-lasting liver disease and spreads typically through raw or undercooked seafood or contaminated raw produce. Infected food handlers are often the source of food contamination.

ii. Parasites:

Some parasites, such as fish-borne trematodes, are only transmitted through food. Others, for example tapeworms like *Echinococcus spp.*, or *Taenia solium*, may infect people through food or direct contact with animals. Other parasites, such as *Ascaris*, *Cryptosporidium*, *Entamoeba histolytica* or *Giardia*, enter the food chain via water or soil and can contaminate fresh produce.

iii. Prions:

Prions, infectious agents composed of protein, are unique in that they are associated with specific forms of neurodegenerative disease. Bovine spongiform encephalopathy (BSE, or “mad cow disease”) is a prion disease in cattle, associated with the variant Creutzfeldt-Jakob Disease (vCJD) in humans. Consuming bovine products containing specified risk material, e.g. brain tissue, is the most likely route of transmission of the prion agent to humans.

iv. Chemicals:

Of most concern for health are naturally occurring toxins and environmental pollutants.

- **Naturally occurring toxins** include mycotoxins, marine biotoxins, cyanogenic glycosides and toxins occurring in poisonous mushrooms. Staple foods like corn or cereals can

contain high levels of mycotoxins, such as aflatoxin and ochratoxin, produced by mould on grain. A long-term exposure can affect the immune system and normal development, or cause cancer.

- **Persistent organic pollutants (POPs)** are compounds that accumulate in the environment and human body. Known examples are dioxins and polychlorinated biphenyls (PCBs), which are unwanted by-products of industrial processes and waste incineration. They are found worldwide in the environment and accumulate in animal food chains. Dioxins are highly toxic and can cause reproductive and developmental problems, damage the immune system, interfere with hormones and cause cancer.
- **Heavy metals** such as lead, cadmium and mercury cause neurological and kidney damage. Contamination by heavy metal in food occurs mainly through pollution of air, water and soil.³⁷

(2) Risks

Food safety depends on the ability of decision-makers to evaluate the likelihood that harm will occur due to a given hazard, namely, determining the level of risk to consumers. This encourages decision-makers to make choices based on the best available information and helps to ensure that the finite resources available to invest in food safety are used most efficiently.³⁸

There is no obligatory global approach to risk analysis that authorities or decision-makers must adopt, and different food safety management systems deal with risk in slightly different ways. Nevertheless, the FAO argues that “risk analysis must be the foundation

on which food control policy and consumer protection measures are based.”³⁹

Risk analysis is defined by the Codex Alimentarius Commission as a process composed of three components:⁴⁰

Risk assessment⁴¹ is the scientific evaluation of known or potential adverse health effects resulting from human exposure to foodborne hazards. The process consists of the following steps:

Hazard identification: The identification of known or potential health effects associated with a particular agent.

Hazard characterization: The qualitative and/or quantitative evaluation of the nature of the adverse effects associated with biological, chemical, and physical agents which may be present in food. For chemical agents, a dose-response assessment should be performed. For biological or physical agents, a dose-response assessment should be performed if the data is obtainable.

Exposure assessment: The qualitative and/or quantitative evaluation of the degree of intake likely to occur.

Risk characterization: Integration of hazard identification, hazard characterization and exposure assessment into an estimation of the adverse effects likely to occur in a given population, including attendant uncertainties.

The definition includes quantitative risk assessment, which emphasizes reliance on numerical expressions of risk, and also qualitative expressions of risk, as well as an indication of the attendant uncertainties.



Table: Hazards encountered along the 'farm to fork' pathway

Stage of pathway	Source of contamination	Hazards
Production	Soil	Sewage effluents; animal manure; soil-associated microbial pathogens (<i>Listeria</i> spp., <i>Clostridium</i> spp.); heavy metals; industrial chemicals
	Fresh water	Microbial contaminants; parasite eggs; heavy metals; industrial chemicals
	Salt water	Marine toxins Bacteria: <i>Vibrio</i> spp.
	Fertilizer and soil amendments	Pellet manure and fish emulsion can contain biological hazards; inorganic fertilizers may contain hazardous chemicals; biosolids may contain heavy metals
	Agricultural chemicals	Pesticides, fungicides, herbicides, rodenticides; antimicrobials; illegal growth promoters; disinfectants; fertilizers
	Fodder and roughage	Dioxins; mycotoxins; microbial pathogens (<i>Listeria</i> , <i>Neospora</i> , <i>Clostridium botulinum</i> , <i>Salmonella</i>)
	Animal feeds	Microbes; mycotoxins; metals; processing aids; anti-nutrients; veterinary drugs; persistent organic pollutants; plant toxicants (alkaloids)
	Agricultural workers	Faeces-associated pathogenic bacteria (<i>Salmonella</i> spp., <i>Shigella</i> spp., <i>E. coli</i> O157:H7 and others) Pathogenic parasites (<i>Cryptosporidium</i> , <i>Cyclospora</i>) Pathogenic viruses (hepatitis, enterovirus)
	Plant	Natural toxins: lectins; cyanogenic glycosides; oxalates; trypsin inhibitors
	Livestock	Microbes: <i>Salmonella</i> , <i>Campylobacter</i> , toxigenic <i>E. coli</i> and others Parasites: pork tapeworm; beef tapeworm; <i>Trichinella</i> Commensals Drugs: antimicrobials; hormones
	Aquatic animals	Pathogens: <i>Vibrio</i> spp. Commensals: <i>Clostridium</i> Parasites: trematodes, nematodes Contaminants: <i>Erysipelothrix</i> , <i>Listeria</i> Spoilage: histamine
Harvest	Plant harvesting	Physical hazards: stones, wood splinters Machine lubricants and cleaning materials
	Slaughter	Contamination of meat with gut contents is common; animal skin is another source of contamination; workers; water source; cleaning chemicals
	Aquatic capture	Infected workers
Processing	Infected food handler	Infected workers
	Adulteration with harmful substances	Unauthorized dyes; melamine; formaldehyde (as preservative)
	Processing conditions	Acrylamide
	Packaging	Packaging migrants; unfavourable conditions leading to microbial growth
	Peri-domestic pests	Flies, rodents, birds
Retail	Infected handlers	Infected workers
	Fomites	Equipment, surfaces, clothes
	Peri-domestic pests	Flies, rodents, birds
Home	Inappropriate storage	Temperature, non-food grade containers
	Cross-contamination	From fresh food, water, handlers, fomites
	Insufficient heating	

Source: Delia Grace (2017)

Food safety: a critical part of the food system in Africa

Risk management is the process, distinct from risk assessment, of weighing policy alternatives, in consultation with all interested parties, considering risk assessment and other factors relevant for the health protection of consumers and for the promotion of fair trade practices, and, if needed selecting appropriate prevention and control options.

Food safety risk management includes a broad range of activities; it is a process by which scientific information on health risks and other factors (such as economic, social, cultural and ethical) need to be considered and weighed in choosing

the preferred risk management decision.⁴²

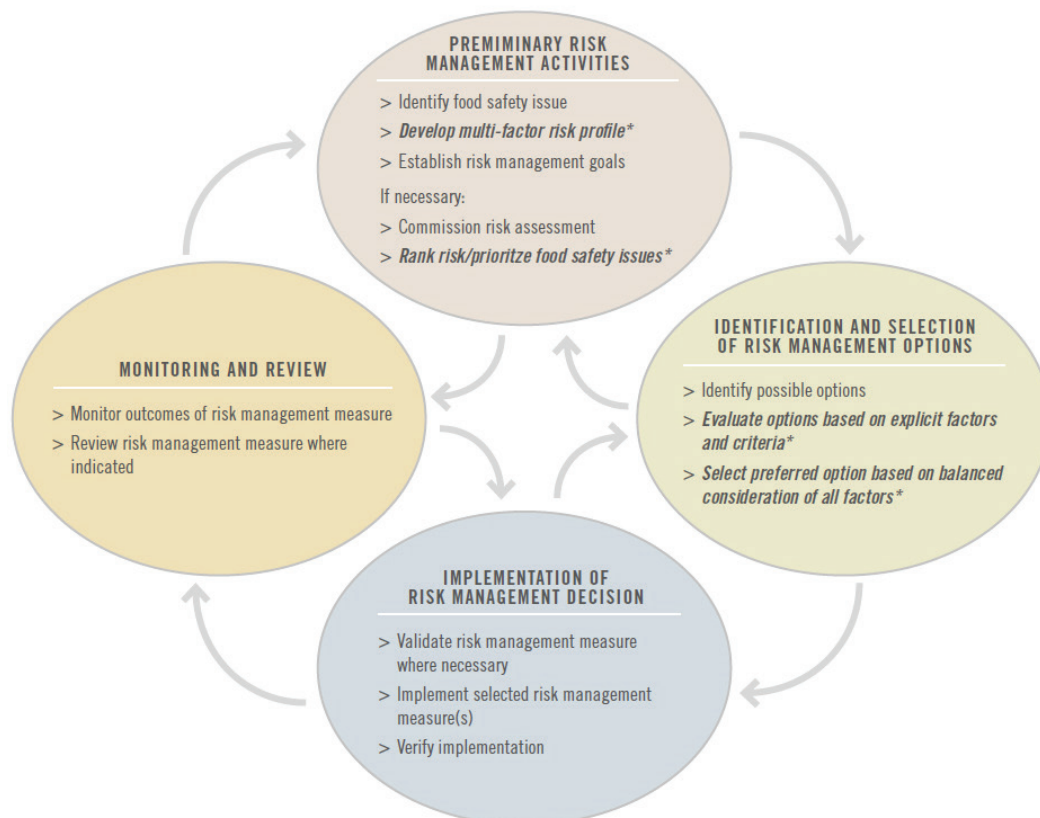
With respect to national food production systems, the issue of food safety is addressed through food safety management systems approach, which are integrated into the various processes of food production, handling, preparation, and storage. Some well-known examples are hazard analysis and critical control points (HACCP), Good Agricultural Practice (GAP) and Good Manufacturing Practice (GMP).

Risk communication is the interactive exchange of information and opinions throughout the risk

analysis process concerning hazards and risks, risk related factors and risk perceptions, among risk assessors, risk managers, consumers, industry, the academic community and other interested parties, including the explanation of risk assessment findings and the basis of risk management decisions.

The overall goal of food safety risk communication is to protect people's health through provision of information that enables them to make informed food safety decisions. Food safety risk information may help people to make decisions about whether to avoid a particular food, how to handle or prepare it in order

Figure: Generic framework for risk management



*These steps reflect the guidance prepared in this document

Source: FAO 2017



to reduce risk, or what they can do to protect themselves if they are exposed to the risk.⁴³

Communication on food safety risk has to be tailored to the specific audience to whom it is addressed, and special care should be taken to understand and distinguish between different target audiences. For example, a message concerning a food safety risk may have to be communicated differently to groups that are especially vulnerable for example, children, pregnant women, the elderly, those located most proximate to the source of the food safety hazard etc.

(3) Food safety management systems

Food safety management systems are applied at the business side of the food system, and are essentially the means by which the private sector ensures compliance with legal or industry obligations regarding

food safety. In some jurisdictions, legislation on food safety will oblige businesses to have a FSMS, and in other jurisdictions, this will not be the case.

Taking the European Commission's definition, a FSMS is a holistic system of prevention, preparedness and own-check activities to manage food safety and hygiene in a food business. A FSMS should be seen as a practical tool to control the food production environment and process and ensure the products are safe. It includes:

- Good Hygiene Practices (GHP, e.g. appropriate cleaning and disinfection, personal hygiene), Good Manufacturing Practices (GMP, e.g. correct dosage of ingredients, appropriate processing temperature), which together are called prerequisite programs (PRPs).
- HACCP-based procedures.

- Other management policies and interactive communication in order to ensure traceability and efficient recall systems.

Scientific understanding in particular has to evolve to keep up with emerging hazards and food safety risks, how they arise and how they can be reduced or managed, and this scientific knowledge must in turn be translated into appropriate measures by the private sector, regulators and the consumers, which will ensure that the risk is reduced.

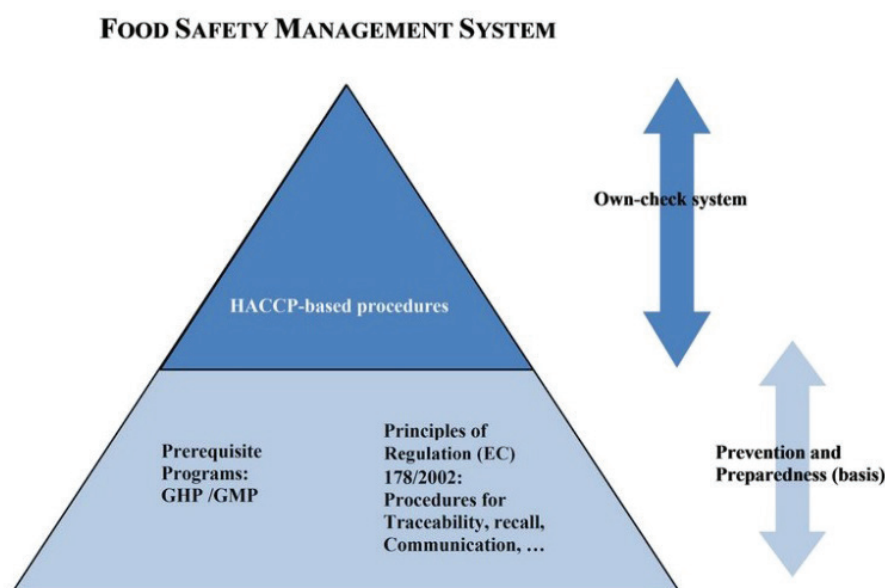
(a) ISO 22000:2018 "Food safety management systems - Requirements for any organization in the food chain"⁴⁴

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees.

First issued as ISO 22000 in 2005, it is a certifiable standard that sets out the overall requirements for a food safety management system. It defines the steps an organization must take to demonstrate its ability to control food safety hazards and ensure that food is safe for human consumption. ISO 22000 is one of ISO's best-known standards, with 32 061 certificates issued in 2015 alone. Within its broad scope, the ISO 22000 family includes standards specific to catering, food manufacturing, farming, packaging, and animal foodstuffs and feed production.

It was revised in 2018 to encompass the latest trends and food safety requirements. ISO 22000:2018 includes improvements to definitions, including those that align with Codex Alimentarius. It also provides a new

Figure: Food safety management system



Source: European Commission (2016)

Food safety: a critical part of the food system in Africa

understanding of the concept of risk, distinguishing between risk at the operational level and the strategic level of a management system. ISO 22000 is based on the Codex principles for food hygiene and this enables authorities to refer to ISO 22000 in national requirements and government inspections to ensure that all the criteria for food safety are met.

As ISO 22000:2018, it continues to set out the requirements for a food safety management system and can be certified to. This is done by mapping

out what an organization needs to do to demonstrate its ability to control food safety hazards in order to ensure that food is safe. It can be used by any organization regardless of its size or position in the food chain.

ISO 22000:2018 specifies the requirements for a FSMS that combines the following generally recognized key elements:

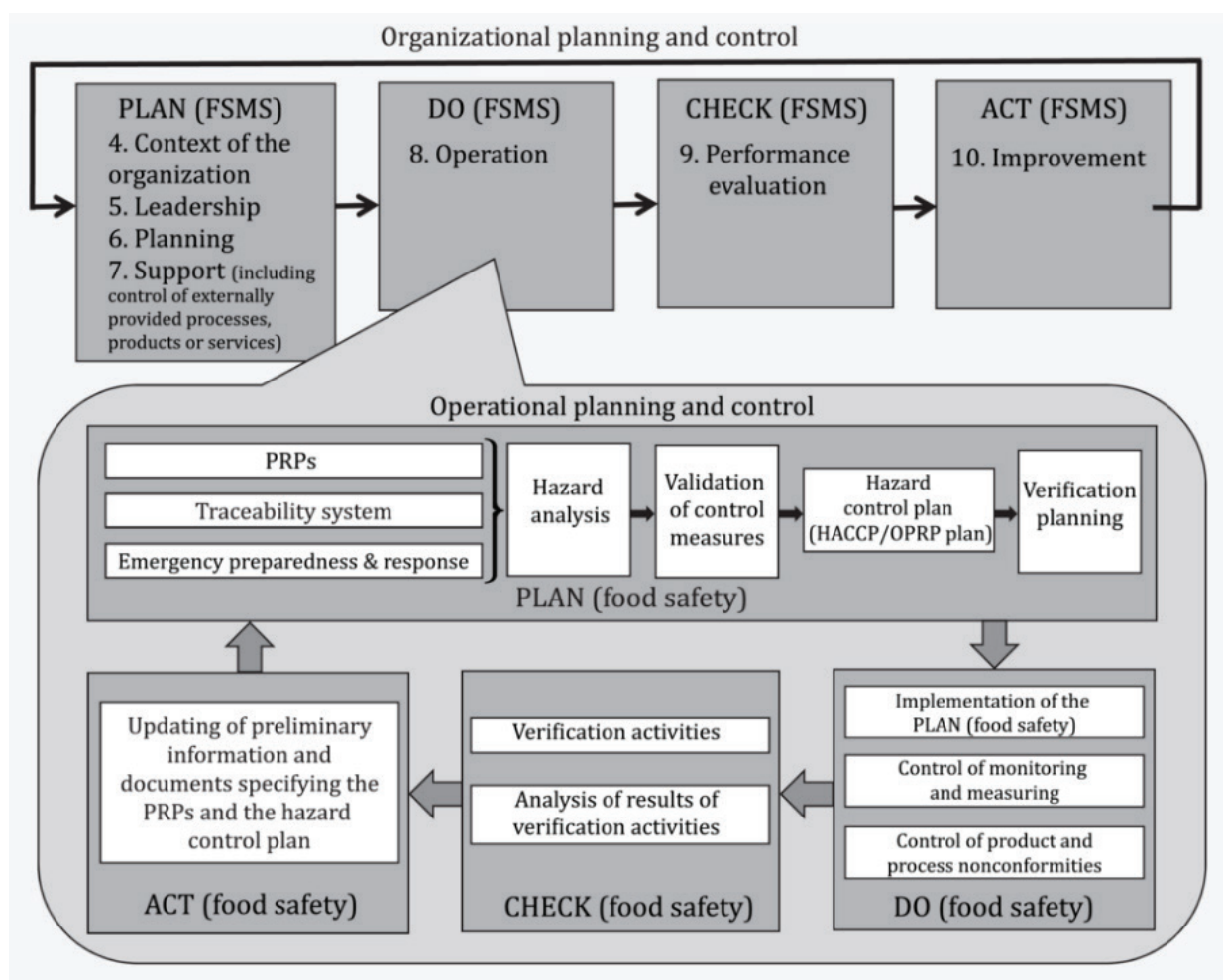
- interactive communication;
- system management;

- prerequisite programmes;
- hazard analysis and critical control point (HACCP) principles.

(b) Hazard analysis critical control point system (HACCP)

The hazard analysis critical control point system (HACCP) is a scientific and systematic way of enhancing the safety of foods from primary production to final consumption through the identification and evaluation of specific hazards and measures for their control to ensure

Figure: How ISO 22000:2018 Works



Source: ISO



the safety of food. HACCP is a tool to assess hazards and establish control systems that focus on prevention rather than relying mainly on end-product testing.

HACCP is probably the most important quality management system for business operators in relation to food safety. In every HACCP procedure there are seven steps to be followed.

1. Conduct a hazard analysis;
2. Identify critical control points;
3. Establish critical limits;
4. Introduce a monitoring system;
5. Implement corrective actions in the case of deviations;
6. Establish record keeping procedures;
7. Produce documentation.

In this way, the businesses can identify any risks in relation to food and establish a clear structure to avoid any such risks arising. The HACCP concept was developed in 1959 at the initiative of the American space agency NASA with a view to ensuring that the food provided for astronauts was 100% safe to consume. The HACCP concept then became directly applicable under EU law as of 2006 with the introduction of the Hygiene package.

(c) Good Agricultural Practices, Good Manufacturing Practices and Good Hygiene Practices

GAPs and GMPs (Good Manufacturing Practices) are a set of principles, regulations and technical recommendations applicable to production, processing and food transport, addressing human health care, environment protection and improvement of worker conditions and their families.⁴⁵

All along the food chain, food products are subject to different preparation processes and conditions likely to contaminate

them. Thus, utmost caution is required throughout the chain to ensure that food is not contaminated. To prevent contamination, good agricultural practices (GAPs), good manufacturing practices (GMPs), and good hygiene practices (GHPs) must be applied to the entire food chain.⁴⁶

The FAO defines Good Agricultural Practices (GAPs) as “practices of primary food producers (such as farmers and fishermen) that are necessary to produce safe and wholesome agricultural food products conforming to food laws and regulations.”⁴⁷

GAPs can be voluntarily certified by producers through standards certification bodies, such as the Global Partnership for Good Agricultural Practices (GLOBALG.A.P.) which established the worldwide standard that assures GAPs. GLOBALG.A.P. was founded in 1997. Today, more than 400 member organizations such as producers, retailers, industry

The role of GAPs and GHPs within FSMS

*M. Uyttendaele L. Jacxsens
S. Van Boxtael*

The application of good agricultural practices (GAP) is widely recognised as the most important measure in assuring the safety of fresh produce, followed by the application of good hygienic practices (GHP) and the certification of food safety management systems (FSMS). GHP are distinguishable from GAP as they are applicable to the whole farm-to-fork continuum and not just primary production steps at the farms (i.e. cleaning and disinfection, pest control, water quality, etc.). Inspections are conducted by national competent food safety authorities and involve

checking compliance to the legal demands. Certification of FSMS is an additional step in the verification of the application of GAP and/or GHP. The verification and certification of food safety systems by an outsider, a third party, is a driver to improve FSMS. In addition, the measured compliance with voluntary quality assurance standards such as ISO22000, BRC or GLOBALG.A.P. is, from a commercial point of view, very important for gaining buyer (and consumer) trust.⁴⁸

and service providers support this initiative. It does so primarily by setting voluntary standards for the certification of agricultural products. GLOBALG.A.P. offers more than 40 standards and programmes for three scopes: Crops, Livestock, and Aquaculture. Such is its reach, that the GLOBALG.A.P. standards apply to 600 certified products and over 188,000 certified producers in more than 125 countries.⁴⁹ A GLOBALG.A.P. standard is a business-to-business certificate and not a consumer label. Retailers rely on GLOBALG.A.P. certification to ensure that the products they sell to their consumers can be traced back to a certified farm or production facility, and consumers can verify whether the products they buy are GLOBALG.A.P. certified.

2.6. The complexity of food safety standards

Food safety standards are measures imposed on all raw and processed food products with the objective of ensuring plant, animal, wildlife and human safety as well as health. The standards are usually set against different food safety hazards which could potentially harm consumers by using scientific risk based assessment. For example, certain sanitary and phytosanitary (SPS) measures require products to originate from a disease-free area, to be inspected beforehand, or they set maximum residue limits (MRLs).⁵⁰

Contemporary agri-food systems are underpinned by an array of inter-related public and private standards. Standards have become a mandatory part of doing business in supply chains for processed food products, beyond basic bulk commodities. Governments have traditionally played the major role in establishing minimum food quality standards and regulations for their populations. This recognises a degree of government responsibility for food quality and safety issues to ensure, amongst other things, the availability of safe food for the population at large and to protect consumers from deceptive and fraudulent practices.

Standards continue to evolve in response to changes in technology, scientific developments regarding the risks associated with food and directly in response to consumer and societal demands. They have proliferated and diversified their coverage over time as value chains have become more complex. At the same time, structural and institutional evolutions based on private control systems and enforcement procedures are taking place in the agri-food sector of many developed countries in conjunction

with trends in consumer demand that have increased the role of private voluntary standards in food chains.

Furthermore, the wider use of private standards has refocused agricultural and food supply chains from price-based to quality-based centres of competition. Quality food standards are now increasingly seen as private goods that differentiate food products and are increasingly in the domain of private firms. Public standards and regulatory controls have also evolved over time in most countries around the world, and have become ever more stringent and complex as consumers demand specific attributes or disclosure of information about certain attributes of food.

Many supply chains for food products have extending beyond national borders, facilitated in part by new processed food products and a policy environment more supportive of international food trade. Minimum quality and safety standards while protecting the consumer often do not allow food retail businesses, food service companies and processing firms in a contemporary food system to differentiate their products based on quality attributes to protect and gain market share when competing in national and regional markets. As a consequence, private standards have emerged to fill this gap and to respond to regulatory developments.

As private food companies and retail businesses expand across the world and develop local and global supply chains, they set standards for the quality of foods they will purchase from suppliers and sell to consumers. These standards may be higher and more demanding than the minimum standards enforced by governments in their national markets. Public standards are still the dominant form of control in the

food systems of most countries,⁵¹ but this equilibrium has shifted in some developing countries whose economies are highly dependent on commodity food exports, where private standards have overtaken public standards across specific value chains as the primary means of control within food systems.

While public standards have been a feature of national food systems for many years, private standards are a relatively recent element of the food quality landscape and their scope and coverage differs widely across countries and food products. Private standards have proliferated in a number of industrial countries in recent years, operating alongside public regulatory systems and are playing an increasing role in the governance of agricultural and food supply chains.

To some extent, private food quality standards have emerged in response to increasingly stringent regulatory requirements and reputational risks, including product liability exposure, faced by leading firms operating supply chains, most notably major food retailers and food service firms. However they have also been employed to facilitate competitive strategies of product differentiation on the basis of an increasingly wide array of food quality characteristics or attributes designed to respond to new consumer demands and concerns.

Private standards have gone from being well established in a number of developed countries and to extending their global reach to middle income and some low-income countries, and have even come to displace public standards in certain supply chains. The latter reflects in part the downstream consolidation that has taken place in the food sector resulting in



increasing ownership concentration with an ever smaller number of large multinational food retail chains, food service operators and food manufacturers. These firms have the bargaining power to impose their proprietary standards on different suppliers in sourcing their products from wide geographical areas and through competitive strategies centred on their own or private brands when operating across national borders. As a consequence, national food quality control systems in many countries increasingly reflect a mix of public and private standards.

Government standards imply the existence of domestic or international legislation specifying the standard. They are set by law and hence typically mandatory. In contrast, private standards and their implementation, including conformity assessment, are the responsibility of the private sector. Private standards are thus defined as voluntary but can become quasi-mandatory if producers wish to gain access to a market in which the private standard applies to a large share of the market. Particularly in developing countries, producers and processors of agrifood products have increasingly faced strong pressure to comply with the private standards of supermarkets and retailers who dominate the global agri-food market with large market share. In setting standards, particularly those

that impact on a firm's production process, governments typically seek expert/technological advice from producers. In fact, some process standards that were originally developed for use by a given industry, have since been adopted by government for more widespread use. Examples include the Hazard Analysis Critical Control Point (HACCP) system that was originally developed by the agri-food industry, as well as the standards developed by the International Standardisation Organisation (ISO). Private standards incorporate those governmental standards that are obligatory for producers. While private standards in the agri-food sector are based on government standards, they may also exceed governmental requirements. This particularly relates to requirements in the production process. On the one hand, private standards initiatives use tighter processing requirements that help producers differentiate their products and charge higher prices. On the other hand, private standards initiatives insist on management systems beyond governmental requirements so as to better control quality. This is because recalls and food contamination scares can damage the reputation of an entire industry. The BSE crisis, for example, harmed consumer confidence in the safety of beef products leading to a large decline in beef consumption in Europe.⁵²

Although private standards are necessarily voluntary in nature, they may be applied by the majority of suppliers, reflecting the economic advantage of standardisation or market requirements. In terms of the latter, proprietary private standards may become virtually obligatory or "de facto" mandatory in some agricultural and food markets as supplying firms have little option but to comply in order to enter or remain within a market effectively controlled by a few large buyers with oligopsonistic power. The end result can be the same as if a public regulation had been imposed. Private standards, which are increasingly buyer-driven in nature and global in reach, are seen as important drivers of change in agrifood systems of developed and increasingly developing countries. The promulgation of private food quality standards has been supported by the development of quality metasystems such as Hazard Analysis and Critical Control Point (HACCP) procedures, Good Manufacturing Practice (GMP), Good Agricultural Practice (GAP) and so forth. Some observers have viewed such meta-systems as "codes of conduct" for participation in the agri-food system and achieving a particular food quality attribute. Increasingly such systems are seen as governing the operation of the entire supply chain from farm production and processing to distribution and final retail sale of the food product.⁵³

3. Food safety in the African context

In developing countries and in Africa in particular, regulations have been largely ineffective in the domestic markets where most people buy and sell the riskiest perishable products. This failure can be attributed to poor governance, inappropriate food safety systems, and a lack of information, incentives for compliance, and resources. Approaches that are possibly more promising involve working with the informal sector to gradually improve

practices and building systems with positive incentives for compliance.

On the other hand, African governments, the African Union and the United Nations (through the Sustainable Development Goals) have all recognized the central role that market-driven agriculture and value added agri-businesses must play in Africa's development and in the struggle to achieve food security for all its people. This means

supporting African farmers and food companies in building viable commercial operations and taking advantage of the growing demand for food, not only in their local rural communities but also in and around Africa's rapidly growing cities and in global markets outside Africa.

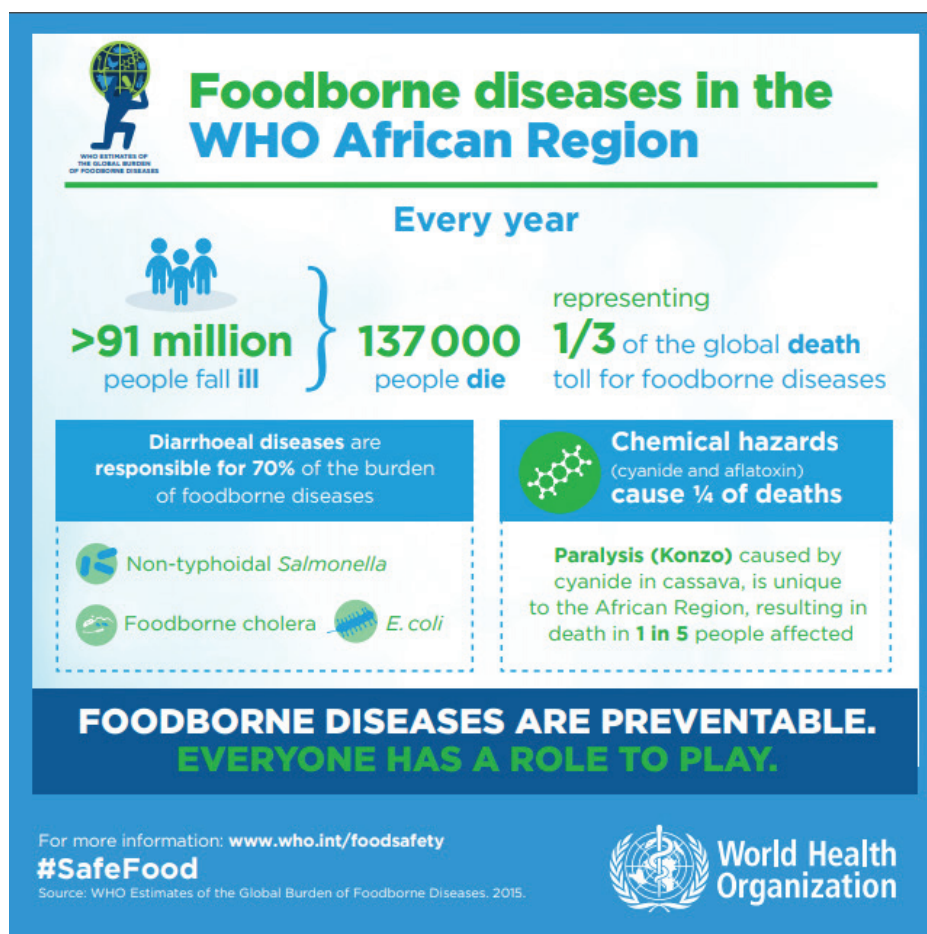
In this context, policy-makers should build and maintain adequate food systems and infrastructures (e.g. laboratories) to respond to and manage food safety risks along the entire food chain, including during emergencies and foster multi-sectoral collaboration among public health, animal health, agriculture and other sectors for better communication and joint action.

While food safety is a fundamental social value in its own right – for public health and as a recognized element of food security – it is also a prerequisite for market access and commercial success in today's global food system. The world is moving toward elevated and harmonized food safety standards that reflect modern best practices, a process that will continue in response to consumer and market demands and that will affect farmers and food companies worldwide. This elevation of standards potentially puts at a competitive disadvantage, however, food producers in developing countries where the capacity to meet those standards is lacking.

3.1. Foodborne diseases in Africa

Foodborne illnesses disproportionately affect African countries, and data from the World Health Organization shows that up to

Figure: Foodborne diseases in the WHO African Region



Source: WHO estimates of the Global burden of foodborne diseases. 2015⁵⁴



a third of the global deaths caused by foodborne illnesses take place in the continent. The wider impact that foodborne illnesses have on food security and nutrition in Africa are also troubling. Unsafe food is a direct contributor to, and closely correlated with, poor nutritional outcomes in Africa, such as stunting. Additionally, a large amount of food Africa is lost to postharvest losses – some estimates put this figure as high as 50%. Inadequate food safety practices during production can result in high levels of postharvest losses, which then lead food to become contaminated. For example, inadequate storage facilities may allow pests such as rodents to access harvested crops, which may destroy food through consumption, but also lead to the spreading of food safety hazards such as bacteria.

In most countries⁵⁵ either no regulatory measures/infrastructure are in place to assure food safety in informal markets, or the regulations are derived from industrialized countries and are anti-poor and

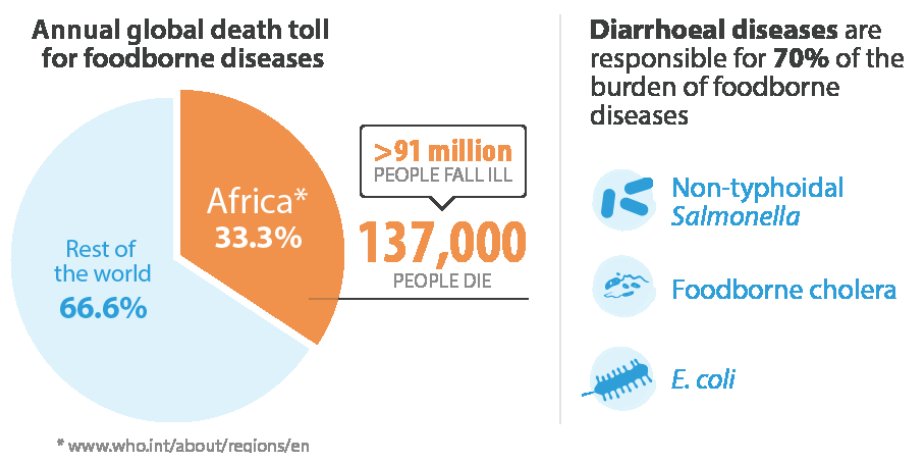
unworkable. Typically, multiple institutions have mandates for food safety through various regulations or acts targeted to various stages and activities in the food chains. Some important public health hazards are believed to be common in food but few are regularly surveyed; the actual status of many important health hazards is unknown. Most food in the traditional/informal sector is not inspected. Where some inspection occurs, it does not follow a 'farm to fork pathway' approach.

These challenges are further compounded by the nature of food systems in Africa, having to contend with an increasing population which demands more food, and changes in diets as more people live in urban and peri-urban areas and are able to afford the types of foods that overwhelmingly associated with foodborne illnesses, particularly perishable foods. The informality of the food systems is often quoted as key challenge, particularly on the production and distribution side.

According to Grace (2017), "historically, FBD [foodborne disease] has not been considered a development priority", and the push towards food safety in developing countries has for many years been largely heralded by the growth in international trade. An important push factor for African countries to adopt new food safety rules or update existing ones was their integration into global food value chains, notably through membership of international bodies such as the World Trade Organization, and via trade, investment or economic partnership agreements signed with regional and international partners. Private sector and agribusinesses have also put pressure on governments to introduce stricter food safety rules and related measures in developing countries, in order to allow their agricultural products to gain and maintain access to lucrative international markets.

Whether this approach has been beneficial to developing countries overall has been the subject of debate from researchers and policymakers. Critics argue that it leads to an asymmetry in the protection of consumers in developing countries, whereby those who purchase goods that are *not* traditionally marketed for export, are exposed to higher risk of harm because more investment has gone into assuring the safety of goods that are destined for export. A better understanding of food safety and its contribution towards development is encouraging development organisations and African governments to place greater emphasis on the domestic and regional priorities related to the implementation of food safety policies, rather than just responding to just the demands of the international markets, which are unilateral, ever increasing, and costly for developing countries to comply with.

Figure: Foodborne diseases in Africa



Source: WHO cited in CTA Spore Magazine

Compliance with food safety standards and certification requirements.

Africa Agriculture Trade Monitor, 2018

Global high-value food markets demand stringent compliance with international standards. Increased investment in agroprocessing and greater access to dynamic value-added markets would require the adoption of acceptable certification protocols. In efforts to comply with these global requirements, smallholder farmers are often unable to participate, as has been the case with Kenya's lucrative horticulture industry. A number of countries and private companies are assisting producers in implementing and applying international certification requirements (Africa Progress Panel 2014).

Growing concern over health risks associated with imported food products has prompted revisions in sanitary and phytosanitary

(SPS) standards in industrialized countries. According to Brenner (2014), recent changes in aflatoxin standards in the European Union (EU) will likely reduce the export of African nuts, dried fruit, and cereals by 64 percent, resulting in a loss of US\$670 million. In 2012, EU imports of SSA commodities that may be affected by standards compliance amounted to €7.9 billion. SSA is Europe's main supplier of cocoa and a major provider of coffee and tea. Several African countries exported millions of euros worth of cane sugar, molasses, and nuts and fruits to Europe in 2012.

Compliance with international standards requires public and private sector participation. In Kenya, green bean producers and exporters have been successful in making the required adjustments to meet increasingly strict EU food safety standards (World Bank 2013). This has involved certifying producers according to the new standards and

developing market infrastructure including cold chains and certified packaging facilities. The Kenyan government invested in road and air transport infrastructure and provided extension services and market information, while the private sector played a key role in coordinating producers. Originally, large exporters contracted with smallholder producers, helped them access inputs and equipment, and provided technical assistance and monitoring. Later, producer organizations took on the role of coordinating smallholders.

As requirements grew more stringent, certification costs grew too onerous for smallholders, and the green bean export industry became increasingly dominated by larger producers. However, smallholders continued to produce green beans for the domestic markets, and employment opportunities on large farms have provided other income opportunities (World Bank 2013).⁵⁶

3.2. Urbanisation and Food Safety Implications

Rural transformation in Africa is taking place at a fast pace. Although there are gaps in the available data there is evidence that this is having an impact on the structure and functioning of Africa's food systems, raising many potential challenges – and also opportunities – for food safety in many African countries and regions. As evidenced in numerous case studies, urbanisation, increased wealth and rapidly changing consumption patterns have led to a significant increase in the proportion of diets made up of non-grain foods (dairy, fish, meat, vegetables, fruit and tubers), as well as heavily into processed foods.

Changing consumption patterns and diets in urban areas create demand for processed foods and with the projected growth of the urban population in Africa over the coming decades, there is the potential for significant changes in food consumption patterns towards more processed, higher value non-staple or perishable goods, notably meat, dairy, fruit and vegetables.⁵⁷ Rural economic policies that incorporate changing consumption patterns can stimulate growth in the rural farm and non-farm economy along food value chains and assist in shifting value-adding activities and jobs in the “middle” of value chains, often related to processing, packaging and distribution of agricultural products, to rural areas. At the same time, better integrated city-region food systems can contribute to increasing

the food and nutrition security of whole regions by supporting local production and establishing short supply chains.

There exist strong growth opportunities for the agribusiness sector. Both domestic and global markets are experiencing strong demand, which is likely to continue even as domestic demand accelerates. The return to economic growth in Africa since the 1990s, burgeoning urbanization, and buoyant global commodity markets now provide unprecedented market opportunities for Africa to develop a competitive agribusiness sector. Urban food markets are set to increase fourfold to exceed US\$ 400 billion by 2030, requiring major agribusiness investments in processing, logistics, market



infrastructure, and retail networks. The growing middle class is also seeking greater diversity and higher quality in its diets. The most dynamic sectors overall are likely to be rice, feed grains, poultry, dairy, vegetable oils, horticulture, and processed foods for import substitution, along with the traditional tropical exports and their derived products (especially cocoa, rubber, cashews, and palm oil), together with some higher-value horticultural crops, fish, and biofuels for export.

Success stories can be found among African countries, in particular in the processing of local food staples such as cassava in Nigeria and millet in Senegal. The scope for enterprise growth and innovation in the staples sector should be significant in Sub-Saharan Africa, judging from the projected rise in urban demand for local food to \$150 billion by 2030. The same projections indicate potential income gains of \$30 billion for local smallholders, should African countries succeed in positioning domestic sectors competitively in these markets.⁵⁸

In Eastern and Southern Africa, Dolislager, Tschirley and Reardon (2015) estimate that the share of non-grains in the total food expenditure of an average urban household is 66% compared with 61% for the average rural household and 54% among poor rural households; in Asia, the respective figures are 74% (urban households), 63% (rural households) and 62% (rural poor). Other notable dietary changes observed include greater demand, particularly in urban areas, for processed foods, meat products, dairy and diverse fresh fruits and vegetables. All of these are positively associated with higher incomes and urbanization.

A recent study⁵⁹ shows how diets are changing in Africa through survey

data from six African countries that explores the consumption patterns of different income groups in rural and urban areas. It shows that as incomes rise, highly processed foods take an increasing share of the food basket value; this is true for rural as well as urban settings. In urban areas, in the highest income group, highly processed foods take 65% of the value of the food basket compared to 35% for this group in rural areas. The diets of the poorest households in urban areas are also a concern as they spend 31% of their food basket on highly processed foods.

West Africans are consuming a wider range of starchy staples (cereals, roots and tubers) than in the past, including more convenient “fast foods” derived from them. Demand for convenience – foods that are quick and easy to prepare and consume – is an overarching trend cutting across all countries and income groups. Increasingly pressed for time, consumers are willing to pay for others in the food system (processors, street-food vendors) to carry out some or all of the food processing and preparation for them, leading to rapidly growing demand for processing activities.

Much of the recent agricultural policy focus has been on understanding farmers’ constraints and helping overcome them. Yet in increasingly buyer-driven agricultural value chains, consumers are the ultimate financiers of the food system. Therefore, an improved understanding of their evolving preferences in terms of quality, convenience, safety and other food attributes is a prerequisite for producers to respond better to demand trends and successfully compete with imports. Safely and efficiently producing and delivering these to consumers entails tight co-ordination along all stages of the food system

— from seed to the consumer’s table — requiring upgraded “hard” and “soft” infrastructure, such as reliable cold chains and improved product grades and standards. More attention should focus on improving the performance of the off-farm elements of the food system (such as marketing, processing, packaging and logistics). At the farm level, public expenditures need to emphasise investments in infrastructure, technology development and farmer support services, rather than just input subsidies to boost long-term productivity.

This approach requires improved market information on specific product attributes, more effective grades and standards and better co-ordination among agricultural value-chain actors. At the same time, consumers of all income brackets need better information on the nutritional qualities and health implications of different food products in order to make informed purchasing decisions. Information on nutritious local foods should be made broadly available and the production and marketing of such food products promoted.⁶⁰

3.3 Street food markets as a source of foodborne illness

Numerous studies have been documented on the potential contamination of street foods by pathogenic microorganisms. Food stalls often lack the necessary storage, refrigeration and cooking facilities to prevent contamination by bacteria. Limited access to clean water and waste disposal increases the risk of contamination being passed on to customers (WHO).

Addressing the challenges of the Informal food trade Government

Food safety: a critical part of the food system in Africa

intervention is clearly important in ensuring that the general public has access to wholesome, safe and nutritious food.

Strategies for improving street food safety include consideration of: Policy, regulation, registration and licenses; Infrastructure, services and vending unit design and construction; Training of food handlers; and Education of consumers.

In responding to this challenge, it is essential to bear in mind the strategic links between efforts to improve food safety and poverty reduction.

Although foodborne disease data collection systems often miss the mass of home-based outbreaks of sporadic infection, it is now widely accepted that many cases of foodborne illness occur as a result of improper food handling and preparation by consumers in their own kitchens. The four most common

mistakes in handling and preparing food at home are the inappropriate storage of food (including inadequate refrigeration, the failure to attain a required cooking and/or reheating temperature), any actions that result in cross-contamination, and the presence of an infected food handler.

The example below on the improvement in the milk safety highlights a combination of policy and practical measures.

Milk safety in Kenya

The government of Kenya estimates that 80% of the milk consumed in the country is purchased from very small-scale vendors in informal markets because it is 20-50% cheaper than in the formal sector, there is more flexibility in the quantity sold, outlets are closer to the consumers' homes, and some vendors even deliver to the doorstep.

Consumption of dairy products is important for child development and has life-long health and cognitive benefits.

Since the early 1990s, global best practice in food safety has evolved from an approach in which the government monitored hazards and punished firms for violating regulatory standards, to a greater emphasis on building the capacity of the private sector to prevent foodborne illness. Prevention-based approaches are particularly well-suited to contexts in which the public sector has limited capacity to perform inspections and tests.

One preventive intervention that has proven effective at improving milk safety in Kenya. A pilot training and certification program in informal

settlements outside Nairobi led to improvements in hygiene practices and microbiological quality. 45% of milk sold by traders who had been trained and used plastic containers met the national microbiological quality standard, compared to just 29% of the milk sold by those who had not been trained (the impact was smaller among those using metal containers, whose milk was more likely to meet the standard even without training). Milk vendors reported that a certificate indicating completion of the training program made it easier to obtain operating licenses from the government, creating an incentive to participate. Other measures to improve milk safety proposed under the National Dairy Development Policy include the development and adoption of low cost technology for small scale dairy investors; public education campaigns on the merits of consuming properly handled (boiled) milk; provision of incentives for procurement and installation of milk testing equipment; stakeholder sensitization on the importance of safe use of antibiotics and other veterinary drugs; and training on milk testing.

In addition, Kenya's National Food Safety Policy of 2013 recommends a broad set of policy interventions to

improve food safety in the country. These include the establishment of a National Food Safety Law and a national Food Safety Authority through which to coordinate government activities related to food safety; investment in training of stakeholders, especially small and medium enterprises (SMEs), on food safety and regulatory compliance; the provision of guidelines and technology to support traceability of food from farm to fork; improved analytical capacity through the accreditation of additional food safety laboratories and maintenance of an inventory of the same; and development of systems for food safety validation, inspection, certification and self assessment as well as an early warning system to prevent outbreaks.⁶¹



3.4. Regional Markets and Food Safety

Governments and institutions in Africa have demonstrated their will to enable the process and develop measures to increase regional trade and integration, within the respective regions and also at the continental level.

Boosting intra-African trade and deepening regional integration offer an effective vehicle to speed up Africa's economic transformation. Increasing the volumes of intra-African trade in agricultural products and the elimination of non-tariff barriers have the potential to boost industrialization and enhance competitiveness, at country and industry levels, through higher investments in connectivity and infrastructure, both physical and digital.⁶²

In June 2015 the Tripartite Free Trade Agreement (TFTA) was launched by the member states of the regional blocks representing Eastern and Southern Africa, namely the East Africa Community (EAC), the Common Market for Eastern and Southern Africa (COMESA) and the Southern African Development Community (SADC), which are also the three largest regional economic communities (RECs) on the continent. The TFTA is the largest free trade zone in Africa: it covers 48% of the countries, 58% of continental output, 57% of its population, and 25% of intra-regional trade (African Economic Outlook 2016). An even more ambitious regional trade and integration project was initiated on the same month at the 25th Summit of the African Union, with the launch of negotiations for the Continental Free Trade Area (CFTA) which would conclude in 2017, with the objective that from this date there will be a

single market of more than 1 billion people (with an estimated 2 billion or more by 2050), boasting a gross domestic product of more than USD 3 trillion. It would cover all eight RECs currently recognised by the African Union.⁶³

A defining feature of this regional trade and integration agenda is the weight that has been given to agriculture as a critical sector for enabling greater inter and intraregional trade within the continent, and specifically for its potential to deliver the greatest economic welfare for rural communities (where over 60% of Africans still live)⁶⁴ and in reducing poverty levels. This is in line with the current recognition of agriculture as a focal sector among many African countries, including some of the continent's biggest economies, as well as regional and international institutions which have also identified agriculture as a priority sector.⁶⁵ The African leaders agreed to triple intra-African trade in agricultural commodities and services by 2025 as part of the Malabo Declaration adopted at the 23rd Summit of the African Union held in Malabo, Equatorial Guinea in June 2014.

Food security in Sub-Sahara Africa can only be achieved through enhanced regional trade and integration. Badiane and Odjo (IFPRI, 2016) argue that the "increase in intra-African and intra-regional trade, and the rising role of continental and regional markets as major destinations of agricultural exports by African countries suggest that cross-border trade flows will exert greater influence on the level and stability of domestic food supplies". Climate change and other environmental factors leading to food shortages have made it more critical than ever to enhance resilience in agri-food systems. In

Eastern and Southern Africa, the year 2016 saw the effects of the El Niño weather phenomenon having drastic consequences for agriculture and food security, leading to a regional maize production shortfall of 9.3 million tonnes in Southern Africa and a drought in Ethiopia that led to food shortages. It is therefore critical to promote regional trade in order to achieve food security, particularly in the face of food price volatility and climate change (Sabwa, IFPRI 2016).

Africa remains a net importer of food, and since 1980 its food imports have consistently grown faster than exports, peaking at a record high of around 50 billion USD in 2008.⁶⁶ According to the African Development Bank, the continent spends up to 35 billion USD annually on imported food, a figure which if the current trend continues, could see the food import bill in Africa rise to 110 billion USD by 2025.⁶⁷ This rise in food imports has been driven by a number of factors, including the continent's booming population, which has doubled in the last 30 years, and increasing demand for food particularly from growing urban areas, whose patterns of consumption tend to favour processed and imported goods. Lastly, Africa's agricultural productivity has failed to keep pace with these trends and has remained uncompetitive compared to imported agricultural products. Poor productivity is reflected in the low use of inputs (fertilisers, pesticides, water/irrigation, hybrid and pest-resistant seeds etc.) and other technologies in most of agricultural production across Africa. In many cases small scale family farmers, who make up the lion's share of the continent's agricultural producers, rely almost entirely on physical labour to achieve productivity.

Regional markets, enhanced inter- and intra-regional trade and greater integration between African countries are needed in order for the continent to develop greater resilience to shocks and fluctuations in international markets. It is also critical to the transformation of agriculture in the continent as regional value chains can deliver economies of scale for producers and manufacturers, and in turn, promote greater investment into the sector, as well as higher levels of productivity and competitiveness against imported food products. Comparing global levels of intraregional agricultural trade as a share of total trade in agricultural products provides a telling indication of the relationship between the level

of regional integration, and intra-relational trade. Among European countries, the levels of intraregional agricultural trade as a share of total agricultural trade stood at 75%, in Asia it was 63% and in American countries at 40%. In Africa, between 2000 to 2013, this figure fluctuated between 13% to 20%, significantly lower than that of other, more integrated regions (Goundan and Fall, IFPRI 2016). The authors put this down to a number of factors, such as weak productive capacity, lack of trade related infrastructure and services, limited role of private sector in regional integration initiatives, low diversification of traded products, the small size of consumer markets and the quality of institutions, among others.



4. New technologies in support of food safety

Business transactions in agriculture have been transformed by the digitisation of the value chain. The first big impact came with barcodes, which made it possible to track items through a value chain. Then came handheld mobile data collection devices, more affordable sensors to track conditions, followed by the internet to transform links with consumers. Mobile phones now take over many of these roles. Barcodes have been replaced with RFID and QR codes.⁶⁸

Advanced technologies, including remote monitoring, data recording and analytics, can provide a real solution to help mitigate risk in increasingly complex modern food supplier chains. Technology and marketing innovations have considerably improved food safety.

Mobile phones and Internet tracking are already providing more comprehensive and accurate surveillance, and molecular epidemiology allows tracking of pathogens from the victim to the source. Also, continued innovation in intensive farming systems can reduce hazards at the source, mitigate environmental damage, and dampen the development of antimicrobial resistance.⁶⁹

Farming enterprises will make much greater use of ICTs to maximise production efficiency and minimize costs. Better weather and crop production forecasting can be achieved through the combined use of satellite data, Geographic Information Systems (GIS) and High Performance Computing (HPC). Low cost sensors, farm automation, and satellite data will enhance precision farming, increase yields and facilitate disease detection.

Consumers will use ICTs to be informed, express satisfaction or complaints to the industry.

ICT technology is becoming an important part of logistics (especially in transport, testing and control) and allows for consistent traceability and fast product identification and is also part of smart packaging concepts. Smart sensing, tracing, packaging, monitoring and reporting will support safety in food life cycle.

ICT can improve packaging, shelf life and safety (e.g. through smart labels) as well as providing technologies for tracking, tracing and assessing ecological footprints (e.g. through RFID tagging).⁷⁰

Blockchain technology⁷¹ enhances transparency

Consumers have grown used to tracking and tracing through value chains with eco-labels and certification systems. But at the end of the chain, regardless of the involved labels, it is difficult for consumers or stakeholders to verify what has happened to a product along the way. Furthermore, certification processes in value chains are not always consistently reliable. What the blockchain could offer is more certainty about the integrity and correctness of the information accompanying goods.

Blockchain food traceability is gaining momentum in the global agrifood sector. The ability to instantaneously trace the entire lifecycle of food products from origin through every point of contact on its journey to the consumer bolsters credibility, efficiency and safety. Consumers would have the ability to

trace their food from “farm to fork” with a scan of a QR code. Blockchain holds the promise of disruptive transformation, but not without potential roadblocks along the way. Transparency can be a double-edged sword in a dynamic market environment.

Additional benefits include fraud prevention and the ability to better tackle outbreaks through prevention methods that can help minimize food testing expenses and improve margins.

There is an impressive list of companies that have started to use the blockchain to safeguard food safety and integrity. Cargill uses it to let shoppers trace their turkeys from the store to the farm that raised them. Walmart, Kroger and other companies have partnered with IBM to integrate blockchain technology into their supply chains. Coca-Cola has employed it to identify cases of forced labour in the sugarcane supply chain. Carrefour is using blockchain to verify standards and trace food origins. Other examples include Downstream beer, which calls itself the world’s first blockchain beer. It uses blockchain technology to reveal production information. ‘Paddock to plate’ is a project designed to track beef and protect Australia’s reputation for quality production, using BeefLedger as a payment platform. JD.com traces the production and delivery of beef raised in Inner Mongolia. GoGo Chicken is tracking chickens with an ankle bracelet, putting the information collected online. The Grass Roots Farmers’ Cooperative uses blockchain to trace how animals are raised. Intel has released a demonstration case

Food safety: a critical part of the food system in Africa

study showing how Hyperledger Sawtooth, a platform for managing blockchains, could facilitate seafood supply chain traceability. In January 2018, the World Wildlife Foundation announced the Blockchain Supply Chain Traceability Project to crack down on illegal tuna fishing. Ripe.io harnesses quality food data to create the Blockchain of Food. Consumers can use BreadTrail to inform themselves of a product's origin. Finally, the 'blockchain for agrifood' project has developed a proof of concept application targeting table grapes from South Africa.

Benefits and challenges Blockchain technology offers many benefits, providing a secure way to perform transactions among untrusted parties. To improve traceability in value chains, a decentralised

ledger helps to connect inputs, suppliers, producers and buyers. In particular, blockchain is suitable for the developing world, where it can support small farmers by providing them with finance and insurance and facilitate transactions.

Although small farmers supply 80% of the food in developing countries, they rarely have access to insurance, banking or basic financial services. There are various barriers and challenges for the wider adoption of blockchain technology. A case study in the Netherlands revealed that small and medium-sized businesses are too small or lack the expertise to invest in the blockchain by themselves. Current uncertainties are preventing individual parties from developing a convincing business case.

With respect to education, there is a lack of awareness about the blockchain, and training platforms are nonexistent. Moreover, an important barrier is regulation. The current experience of cryptocurrencies indicates that they are vulnerable to speculators and massive price fluctuations. So without some form of regulation, cryptocurrency is not a trusted means yet for use in food supply chains as a comprehensive solution. And there is still a lack of consensus among policymakers and technical experts on how to use blockchain technology and carry out transactions based on cryptocurrency.⁷²



5. The way forward

Action from policymakers, producers and consumers is needed to ensure food safety and prevent foodborne illnesses at a time when rapid urbanisation in developing countries, increased demand for food, especially that which is processed, and longer and more complex supply chains are placing unprecedented pressures on local and global food systems.

New opportunities are also emerging in the fight against foodborne diseases, such as improved and more affordable technologies, increased awareness about foodborne diseases, and global value chains that create incentives for the private sector to provide solutions and innovations that address foodborne illnesses.

In many African countries, the capacity gap includes lack of effective public policies and institutions to provide regulatory oversight; insufficient extension services, research, and other technical assistance for producers; too few trained people to carry out food safety activities in both the public sector and in small-and-medium-size enterprises (SME's) and lack of cold chain facilities, food testing laboratories and other physical infrastructure. These gaps – and the resulting questions about food safety – result in costly illnesses and death for domestic consumers, who rely heavily on informal markets for their food, jeopardize market access and thus economic success for African farmers and food companies.

It is critical to strengthen regulatory frameworks, establish and implement effective food safety systems that ensure that food producers and

suppliers along the whole food chain operate responsibly and supply safe food to consumers.

The cost of compliance varies by country, by industry and by actor but remains significant in most African countries. Suppliers in integrated supply chains are more likely to be informed of changes in requirements before stricter standards are imposed while small farmers will miss this information. Actors in Africa are faced with the cost of modifying their processes, but also with the associated costs of testing the products and carrying out conformity assessments. Even if a country complies with the requirements of the importing country, the costs of demonstrating this may be prohibitively high.

Supporting capacity-building in food safety across Africa

The Global Food Safety Partnership (GFSP) is an innovative, public-private initiative dedicated to supporting and promoting global cooperation for food safety capacity building. GFSP is uniquely able to assess food safety systems and propose systems-based interventions to address specific food sector needs and to prioritize hazards and threats.

Collaborators include leading food and beverage multinationals, intergovernmental organizations, government agencies, global industry organizations, bilateral and multilateral organizations. The work of GFSP is focused on low- and middle-income countries that benefit from the expertise and resources leveraged from among GFSP donors and other stakeholders.

To improve the quantity and quality of food safety capacity building in sub-Saharan Africa, the GFSP commissioned a mapping and analysis of current institutions, initiatives and resources devoted to food safety capacity building in sub-Saharan Africa. The report, *“Food Safety in Africa: Past Endeavors and Future Directions”* provides data, analysis, and recommendations that organizations working on food safety in sub-Saharan Africa (SSA) can use to improve the impact of their efforts. The report focuses on food safety capacity-building investments and activities of the international donor community and ways that both donors and African governments can better target and coordinate those investments, with greater synergy between the public and private sectors. **The central theme of this report is that donors, African governments, and the private sector can work together to maximize the impact of food safety capacity-building investments and improve food safety.** Everyone agrees that such collaboration is needed. The difficulty is catalyzing and sustaining a shift in current practices.

The report provides findings and makes recommendations based on data from over 500 donor-funded projects and activities and input from nearly 200 experts and stakeholders. It provides advice to help donors and African governments better target and coordinate investments, with greater synergy between the public and private sectors.

Current donor investment in food safety in sub-Saharan Africa (SSA) largely reflects the concerns of previous decades and as a result

Food safety: a critical part of the food system in Africa

is substantially focused on access to regional and overseas export markets, with emphasis on national control systems. However, relatively little is being done to reduce foodborne illness among SSA consumers. New understanding of foodborne disease burden and management, along with rapid and broad change within SSA societies and agri-food systems, have led to food safety emerging as an important public health and development issue. There is need to reconsider national government investment strategies and donor support to the same.

The GFSP report supports progress on food safety. It provides up-to-date information on key food safety actors, presents the first ever analysis of food safety investments in SSA, captures insights from a wide-ranging expert consultation, and makes suggestions for attaining food safety, based on evidence but also consensus principles, successful elsewhere but not yet widespread in SSA mass domestic markets.

Recommendations of the GFSP study

New evidence shows the huge health and economic burden of foodborne disease. SSA has the world's highest per capita health burden, which disproportionately affects children and undermines the well-being and economic productivity of the whole population. Food safety also underpins the region's agriculture-led development strategies, including the 2014 Malabo Declaration goal of dramatically increasing trade in food.

Complexity, dynamism and diversity of the food system hinder capacity to plan and target investments but offer opportunities for agri-food system development. Key elements include: predominance of smallholders and

diversity of foods; many hazards and limited understanding on their presence, prevalence and contribution to health risks; diverse rapidly evolving formal and informal, domestic and export markets; infrastructure challenges; complex, underfunded, but modernizing governance systems; emerging consumer awareness and market demands for food safety that vary widely among countries and between formal and informal markets.

International donor organizations are, and have been, major providers of food safety capacity investments. The report documents over 30 bilateral and multilateral agencies, development banks, and foundations. Although, goals, priorities, and strategies have been largely uncoordinated, investments have been appreciated by stakeholders who also see opportunities for re-orientation of investments towards greater impacts. Current donor investment in food safety remains substantially focused on access to regional and overseas export. Much of this donor investment involves activities that are not linked to health outcomes in SSA. The focus reflects priorities that dominated in past decades, which still have relevance but are no longer enough to address broad food safety needs.

National governments and donors should consider a new approach to capacity building. In keeping with best practice, this should have increased public health focus and investment and greater emphasis on harnessing consumer awareness and market forces to drive progress. Export-oriented capacity building remains relevant, but investments need to be shifted, broadened, brought up to date, prioritized and justified. Specific recommendations and their rationale are:

(a) Better address the health of domestic consumers dependent on informal markets: Most of the health burden of foodborne illness in SSA is borne by the majority who depend on informal markets, where only a small fraction of donor investment has focused. While evidence is good that the health burden is huge, there is a lack of data on the impacts of specific hazards required for prioritization and on the range, effectiveness and cost of intervention options.

Recommendation. Citizen health should be at the heart of national food safety systems. SSA national governments and regional institutions, in dialogue with the donor community, should establish health-based goals, priorities, metrics and implementing strategies and help generate the missing evidence needed for rational planning.

(b) Build capacity for well-governed, evidence- and risk-based food safety systems: Risk-based approaches to food safety management are increasingly the norm among governments and firms producing for formal markets: approved by SSA governments, they have yet to be implemented in the informal sector. They provide structured and efficient ways of mitigating risk (such as farm to fork management) but require adaption for informal markets and an enabling regulatory environment. Lack of donor co-ordination and underfunded, fragmented and often poorly governed national food safety systems, contribute to regulatory failure and a significant gap between food safety policy, and implementation in most SSA countries.

Recommendation. National governments should endorse principles of science- and risk-



based prevention, adapted to local conditions. SSA governments together with donors should mutually commit to improving food safety governance. These include: SSA country ownership of building food safety; government commitment to improving institutions and tackling corruption; donor harmonization and alignment with national priorities; and, managing for results and mutual accountability.

(c) Harness marketplace drivers of progress on food safety.

Improvements in food safety have been mostly the result of public demand. In SSA, a “push” approach still predominates, focusing on the public sector and trade goals. In contrast, “pull approaches” use consumer demand for safe food as the major lever for improvement, while supporting the private sector to respond to this demand. The public sector provides enabling regulatory environment that supports private efforts and

increases awareness of food safety among all stakeholders.

Recommendation. National governments, donors and the private sector should use their resources and standing to recognize, catalyze, and support the consumer and marketplace drivers of progress on food safety. This requires well-informed and empowered consumers, able to demand food safety and a private sector that has capacity and accountability to respond to consumer demand.

Glossary⁷³

Abattoir: Any premises or facility where live animals are slaughtered or and any or all of the following take place: meat is cut, wrapped, frozen, cured, smoked or aged.

Acceptable Limit: A point that separates satisfactory conditions from unsatisfactory conditions relative to food safety.

Accredited: A facility that has been recognized by an authoritative body based on a set of requirements that is logical, fair, sensible and rational.

Adulterated Food: Food that has been contaminated so that it is considered unfit and unsafe for human consumption.

Agent: A substance or condition that exerts some effect on food safety.

Allergens: Substances that cause an exaggerated immune response in some people and that may result in a runny nose, watery and/or itchy eyes, a rash, wheezing, serious illness or (occasionally) death.

Audit: Systematic organized and independent examination that may involve both paper reviews and on-site checking of a food processing facility to determine whether the operation is following the rules of its food safety system. An audit looks for proof that you do what you say you do, and it is appropriate.

Bacteria: Single-celled organisms that live in and around humans and other hosts, and that are too small to be seen with the naked eye.

Batch Number or Lot Number: A distinct identification code for each product or batch. It may be in the form of a distinctive combination of letters, numbers or both assigned to a specific identifiable batch/lot of production. It is usually found on each individual container.

Biological Hazard: Any danger to food safety by the contamination of food with illness or disease-causing organisms.

Certification: The status obtained after being successfully certified under a food safety certification audit. The facility receives certification once it has provided evidence to that its food safety system meets the specified requirements of the food safety standard.

Certification Body: An organization that is licensed to conduct audits and provide official recognition of compliance to certain standards.

Chemical Hazard: Any chemical that through contamination presents a danger to food safety.

Clean: Free of soil particles and other foreign material.

Code: A systematic collection of regulations and rules of procedure or conduct (e.g. General Principles of Food Hygiene or the Food Retail and Foodservices Code).

Codex or The Codex Alimentarius Commission: An organization formed by the World Health Organization (WHO) and Food and Agriculture Organization (FAO). Comprised of representatives from 165 countries, it develops internationally accepted food safety standards.

Cold Chain: The process of maintaining proper refrigeration or freezer temperatures during transportation to prevent deterioration of food products or ingredients.

Communicable Disease: An illness that is caused by an organism, microorganisms or its toxins. It is transmitted directly or indirectly from an infected person or animal, or through the environment by water, air or other means.

Conformity: Ability to meet set standards.

Contamination: A condition that can affect food that has been exposed to and faced introduction of foreign matter, including filth, a poisonous substance or pests, disease-causing microorganisms or parasites, or toxins.

Food safety: a critical part of the food system in Africa



Contaminant: any biological or chemical agent, foreign matter, or other substances that may compromise food safety or suitability.

Control Measure: Any action or activity that can be used to prevent, reduce or eliminate a food safety hazard.

Control Point (CP): Any step at which biological, physical, allergenic or chemical factors can be dealt with through operational conditions to prevent food safety hazards and to support producing safe food that will not result in an unacceptable health risk.

Critical Control Point (CCP): A point, process step, or a site where an action or procedure can be applied to prevent, eliminate or reduce a food safety hazard to an acceptable level.

Critical Limit: The maximum or minimum level to which an allergenic, biological, chemical or physical hazard has to be controlled to prevent, eliminate or reduce its occurrence to an acceptable level.

Crosscontamination: A situation that occurs when micro-organisms, allergens, chemicals or other hazards that are carried by utensils, hands, towels or other food are transferred from one food, ingredient or surface to another.

Edible Product: Any substance that may be used as food. Endospore: A resting stage of some bacteria, during which the bacteria is resistant to unfavourable conditions. An endospore serves a purpose similar to the seed of a plant.

Environmental Contamination: The presence of hazardous substances in the atmosphere or surroundings.

Food: Any substance, including water and ice, manufactured, sold or intended for use in whole or in part as food or drink for human consumption.

Foodborne Illness: Sickness or injury caused by eating food containing a microbiological, chemical or physical hazard(s).

Food-Contact Surface: The surface of equipment or utensils that food normally touches.

Food-Grade Packaging: Any wrapping or container material that will not transfer noxious or toxic substances into food and has been approved by the Canadian Food Inspection Agency.

Food Handler: A person involved in any activity that relates to food processing, transportation or storage, or who works with a surface likely to come into contact with food.

Food Hygiene: All measures necessary to guarantee the safety of food at all stages of the food chain.

Food poisoning: An illness that occurs when people eat food that has been contaminated with harmful germs (particularly bacteria and viruses) or toxins (poisonous substances).

Food Safety: Activities to protect the food supply from microbial, chemical, allergenic and physical hazards that may occur during all stages of food production and handling.

Food Safety System: A set of procedures or plans designed to ensure that food is protected and wholesome to eat. In food processing, a set of independent but interrelated control elements to ensure compliance with all legislated food safety regulations, the product protection plan or the HACCP plan used, or proposed by a food processor or applicant.

Gap Assessment Audit (GAP Audit): A systematic examination of a food processing program (including the applicable management, production, training and related systems, as well as their records to identify any shortcomings in the program).

General Principles of Food

Hygiene (GPFH): A recommended international code of practice adopted by Codex Alimentarius Commission in 1969 and revised in 1997. This code consists of prerequisites and Control of Food Hazards, similar to the seven principles of HACCP used in development of HACCP plans. The GPFH code contains guidelines for application of both prerequisite programs and Control of Food Hazards Plans in a variety of situations from production through to the consumer.

Food safety: a critical part of the food system in Africa

Generic HACCP Model: Generalized HACCP plans designed for a specific product or product category that can be used as an example or guideline for developing a plant-specific HACCP plan.

Good Agricultural Practices

(GAP's): This refers to an integrated management system and the resulting 'best-practices' designed to ensure the efficient production of safe agricultural products.

Good Manufacturing Practices

(GMP's): General procedures to reduce food safety hazards.

Good Hygienic Practices (GHP):

The basic rules for the clean and healthy handling, storage, processing, distribution and final preparation of all food along the food production chain.

HACCP: Acronym of 'Hazard Analysis Critical Control Point', a systematic approach used in food production as a risk-based means to ensure food safety. A system that identifies, evaluates and controls hazards that are significant for food safety.

HACCP Reference Standard: A written standard that provides all of the details necessary to implement a food safety program based on HACCP. It is an effective means of assuring food safety.

Hazard: A biological, chemical or physical agent or factor with the potential to cause an adverse health effect.

Hazard Analysis: Collecting and evaluating information on agents in or conditions of food with the potential to cause a significant adverse health effect or injury in consumers, and that must be addressed in the HACCP plan.

Hazard Characterization: The evaluation of the nature of the harmful effects associated with biological, chemical, allergenic and physical agents present in food.

Hygiene: Conditions and practices followed to maintain health including sanitation and personal cleanliness.

Immune Response: A bodily defence reaction that recognizes an invading substance (such as a virus, bacteria or allergen) and produces antibodies to counter the invader.

Immunodeficiency: Impairment of the immune response that makes a person susceptible to infection and certain illnesses.

Integrated Pest Management: A decision-making process to foresee and prevent pest activity and infestation.

ISO: International Organization for Standardization, a worldwide federation of national standards bodies (ISO- member bodies). The work of preparing national standards is normally carried out through ISO technical committees. Members of technical committees can be international organizations, governments and non-government groups.

Label: Any legend, word, ticket, tag, sign or mark attached to, included in, belonging to or accompanying any food or food package.

Letter of Recognition: A document awarded to a producer organization or processor following the successful completion of the 'Recognition Audit Process.'

Lot Number: A distinct code for each product, batch or container. A distinctive combination of letters and/or numbers assigned to a specific identifiable batch of production.

Low-Risk Food: Food that is unlikely to contain pathogenic micro-organisms and that (normally) will not support their growth due to the characteristics of the food (e.g. uncooked grains and cereals, bread, carbonated beverages, sugar-based confectionary, alcohol).

Medium-Risk Foods: These foods may contain pathogenic microorganisms but will not normally support their growth due to the characteristics of the food. Usually they are acidic, dried or high in salt (more than 20%) or sugar (more than 50%).

Microbial Hazard: Microscopic organisms associated with foods that have the potential to cause an adverse health effect or injury to consumers.



Microbial: Of or relating to micro-organisms, or to any life form too small to be seen with the naked eye.

Mock Recall: A process designed to assess the effectiveness of a food processor's recall program and the readiness of the recall team. Mock recalls help to identify any gaps in traceability or problems that might have developed (e.g. new employees not following established protocols).

Mould: A small multi-celled plant-like organism (classed a fungi) that generally reproduces by spore formation. These spores are very light and easily carried by air currents. They are also very resistant to drying and freezing, but are easily destroyed by heat.

Non-hazardous Food: A food that has a shelf life greater than 90 days at room temperature.

On Farm Food Safety (OFFS): Food safety programs developed to create the proper operating environment to minimize food safety risks on farms by implementing Good Agricultural Practices.

On-site Verification: The process of checking that the food safety system in an establishment has been implemented as written. This requires an audit of the operating food safety system to confirm it is implemented as designed and that the system is effective in meeting the requirements as set out in the reference standard.

Operator: A person controlling, causing to function or engaging in a food-processing business.

Package: Anything that food is wholly or partly contained, placed or packed.

Parasite: An organism that lives in or on the living tissue of a host organism at the expense of that host.

Pathogen, Pathogenic Bacteria or Pathogenic Microorganism: Any bacteria, virus, mould or other form of life that is too small to be seen by the naked eye and that is capable of causing disease, illness or injury.

Perishable: Any food product or ingredient that is susceptible to deterioration or loss of quality when subjected to temperature abuse.

Pest: Any animal or insect of public health importance, including, but not limited to birds, rodents, roaches, flies and larvae that may carry pathogens that can contaminate foods.

Pesticide: A substance used to prevent, destroy or repel any insect, nematode, rodent, predatory animal, parasite, bacteria, fungus, weed or other form of plant or animal life.

Physical Hazard: Any danger to food safety by the contamination of food with any foreign materials that are not normally found in food.

Risk: The likelihood of an occurrence and the size of the consequences of an adverse event. A measure of the probability of harm and the severity of impact of a hazard. Risk Analysis: A process that includes risk assessment, risk management and risk communication.

Risk Assessment: The process of identifying a hazard and characterizing the risk presented by that hazard in qualitative or quantitative terms.

Risk Communication: An open exchange of information and opinion leading to a better understanding of risk and risk-related decisions.

Risk Management: The process of identifying, evaluating, selecting and implementing alternatives for mitigating or lowering risk.

Sanitation/ Sanitizing: The application of some method or material to destroy all disease producing pathogens and other harmful organisms. Such treatment should result in a surface that is safe from a public health standpoint and that contributes to food protection and an extended shelf life.

Shelf Life: The period of time that a product can be stored under specified temperature conditions and remain suitable for use.

Food safety: a critical part of the food system in Africa

Spoilage Bacteria: Bacteria that break down foods so that they look, taste, and smell bad. Spoilage bacteria primarily affect the quality of food but also may affect product safety.

Standard Operating Procedure (SOP): A written description of a particular task or procedure to ensure safe food handling. A set of instructions describing the activities necessary to complete a task that reduces the risk of foodborne illness.

Sterilize: To completely eliminate microbial viability by approved means. To make free from all forms of life, including bacteria, usually using chemical or heat methods.

Systems Audit: A procedure that verifies the applicant's written food safety system contains all of the required components and that each component meets or exceeds the requirements in the reference standard.

Temperature Abuse: A situation that arises when food is not held at the proper temperature (e.g. keeping raw meat at room temperature for more than two hours before cooking).

Temperature Log: An ongoing record of food temperatures.

Traceability: To check the history, application or location of a food item by means of recorded information by tracking a food item forwards or backwards through the food-supply chain.

Tracing/ Tracking: Identifying the origin of an item or group of items through records back or forward through the food-supply chain.

Validation: The process of obtaining evidence that the elements of your HACCP plan are effective. Validation involves obtaining confirmation that the elements of the HACCP system, including critical control points are complete and effective in controlling biological, chemical, and physical and allergen hazards. This may include challenge studies, heat distribution and process validation studies.

Verification: Verification is the use of methods, procedures, tests and other means to check whether the HACCP system is correctly in place and if it is being followed (e.g. checking to make sure the temperature has been reached). Although the validation and verification activities may be similar, results from verification activities are not intended to be used to make decisions on the acceptability of products. Instead, the verification results are used to check the adequacy of food safety controls or how well they are working.

Virus: Any simple sub-microscopic parasites of plants, animals and bacteria that often cause disease and essentially consist of a core of RNA or DNA surrounded by a protein coat. Since they are unable to reproduce without a host cell, viruses typically are not considered living organisms.

Water Treatment: The use of chemicals or filtration to make water potable or suitable for boiler use.



Acronyms

BTSF Better Training for Safer Food (EC training initiative)	EFSA European Food Safety Association	GAIN Global Alliance for Improved Nutrition	MRL Maximum Residue Limit
CA Certifying authority	EU European Union	GAP Good Agricultural Practices	NGO Non-governmental organization
CAC/Codex Codex Alimentarius Commission	EUREPGAP Euro-Retailer Product Working Group GAP	GAqP Good Aquaculture Practices	OIE World Organization for Animal Health
CB Certification Body	FAO Food and Agriculture Organization (part of UN)	GFSI Global Food Safety Initiative	PCQI Preventive Controls Qualified Individuals
CDC Centers for Disease Control and Prevention	FD&C Federal Food, Drug, and Cosmetic Act	GFSP Global Food Safety Partnership	RTE Ready-to-eat
CFSAN Center for Food Safety and Applied Nutrition (part FDA)	FDA United States Food & Drug Administration	GHP Good Handling Practices	SPS Sanitary and Phytosanitary
COLEACP The Europe-Africa-Caribbean-Pacific Liaison Committee (COLEACP)	FERG Foodborne Disease Burden Epidemiology Reference Group	GIP Good Importer Practice	SQF Safe Quality Food
DG SANCO Directorate General for Health and Consumers (EC)	FoodNet Foodborne Diseases Active Surveillance Network	GMP Good Manufacturing Practices	SSOP Sanitation Standard Operating Procedure
DV Audits Direct Verification Audits	FSIS Food Safety and Inspection Service	HACCP Hazard Analysis and Critical Control Points	TBT Technical Barriers to Trade
ECA European Chemicals Agency	FSMS Food Safety Management System	HARPC Hazard Analysis and Risk-Based Preventive Controls	TCS Time/Temperature Control for Safety
ECDIN Environmental Chemical Data Information Network (EC)	FSSC 22000 Food Safety System Certification	IFS International Food Standard	USDA U.S. Department of Agriculture
ECETOC European Chemical Industry Ecology and Toxicology Centre	FVO Food and Veterinary Office (European Union)	INFOSAN International Food Safety Authorities Network	UNECE United Nations Economic Commission for Europe
		ISO International Organization for Standardization	WHO World Health Organization
			WTO World Trade Organization

Resources

French resources in italics

TECHNICAL CENTRE FOR AGRICULTURAL AND RURAL COOPERATION (CTA)

Food safety: a critical part of the food system in Africa. 2018.
<https://brusselsbriefings.net/2018/08/30/next-brussels-briefing-no-52-food-safety-a-critical-part-of-the-food-system-in-africa/>

ICT Update. Unlocking the potential of blockchain for agriculture. September 2018.
<http://ictupdate.cta.int/wp-content/uploads/sites/5/2018/08/ICTUpdate-88-EN.pdf>

Spore Magazine 2018. The importance of improving food safety in Africa.
<http://spore.cta.int/en/dossiers/article/overcoming-the-burden-of-foodborne-disease.htm>

Spore Magazine. 2018. "Agricultural Trade: Transforming the informal economy" No. 188 March 20, 2018 CTA
<http://spore.cta.int/images/188/Spore-188-EN-WEB.pdf>

Magazine Spore. 2018. « Commerce Agricole : Transformer l'économie informelle » Mars 20, 2018 CTA
<http://spore.cta.int/images/188/Spore-188-FR-WEB.pdf>

Francis, J.A.; Mnyazi Jefwa, J.; Okoth, S.; Aflatoxin and Agriculture-Nutrition nexus in Africa. CTA Technical Brief. 2017.
https://publications.cta.int/media/publications/downloads/2020_PDF.pdf

Kuit, M.; Waarts, Y. Small-scale farmers, certification schemes and private standards: is there a business case? *Series: Value chains & trade*. CTA. 2014.
https://publications.cta.int/media/publications/downloads/1823_PDF.pdf

Kuit, M. et Waarts, Y. 2014. « Petits producteurs, systèmes de certification et normes privées : Le système est-il rentable ? »
<https://publications.cta.int/en/publications/publication/1824/trade/>

Roesel, K.; Grace, D. (ed). Food safety and informal markets: animal products in Sub-Saharan Africa. CTA; CGIAR; ILRI. 2014.
<https://tinyurl.com/ydgwtmyq>

Boto I., La Peccerella C. CTA. Meeting food safety standards: implications for ACP agricultural exports. Reader 2012.
<https://brusselsbriefings.files.wordpress.com/2012/10/reader-br-11-sps-eng1.pdf>

Brussels Briefing. Meeting Food Safety Standards: Implications for ACP agricultural exports. 2009.
<https://brusselsbriefings.net/past-briefings/n11-sps-standards/>

Axtell, B.; Fellows, P. et al. (eds). Setting up and running a small fruit or vegetable processing enterprise. *Series Opportunities in food processing*. CTA. 2008.
https://publications.cta.int/media/publications/downloads/1452_PDF.pdf

Axtell, B.; Fellows, P.; Gedi, L.; Lubin, H.; Musoke, R.; Oti-Boateng, P.; Zulu, R. Setting up and running a small-scale dairy processing business. *Series: Opportunities in Food Processing* (CTA). 2008.
https://publications.cta.int/media/publications/downloads/1434_PDF.pdf

EUROPE-AFRICA-CARIBBEAN-PACIFIC LAISON COMMITTEE (COLEACP)

COLEACP. 2011. PIP « *Principes d'Hygiène et de Management de la Qualité Sanitaire et Phytosanitaire* »
https://www.sustainabilityxchange.info/filesagri/COLEACP_Manuel_1_FR.compressed.pdf

COLEACP. 2009. "Position paper on the potential impact of proposed changes to EU pesticide regulations on ACP countries" PIP Report.
https://www.coleacp.org/en/system/files/file_fields/2018/08/29/positionpaperontheimpactofproposedchangesof.pdf

EUROPEAN UNION

Commission Notice on the implementation of food safety management systems covering prerequisite programs (PRPs) and procedures based on the HACCP principles, including the facilitation/flexibility of the implementation in certain food businesses (C/2016/4608)
<https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52016XC0730%2801%29>



Communication de la Commission relative à la mise en œuvre d'un plan de maîtrise sanitaire du secteur alimentaire applicable aux programmes prérequis (PRP) et aux procédures fondées sur les principes HACCP, y compris la flexibilité accordée à certaines entreprises (C/2016/4608)

<https://eur-lex.europa.eu/legal-content/FR/TXT/?uri=CELEX%3A52016XC0730%2801%29>

European Commission. 2014. "Food safety From farm to fork : safe and healthy food for everyone" <https://publications.europa.eu/en/publication-detail/-/publication/946e612c-6b31-4805-89bc-b0c90fa881cf/language-en>

Commission européenne, 2014. « Sécurité alimentaire De la ferme à la table : des aliments sûrs et sains pour tous » <https://publications.europa.eu/fr/publication-detail/-/publication/946e612c-6b31-4805-89bc-b0c90fa881cf>

FOOD AND AGRICULTURE ORGANIZATION

FAO. 2017. "Food Safety Risk Management: Evidence-Informed Policies and Decisions, Considering Multiple Factors" FAO Guidance Materials. FAO, Rome. <http://www.fao.org/3/i8240en/i8240EN.pdf>

FAO and PAHO. 2017. Food Handlers Manual. Instructor. Washington, DC : PAHO, 2017. <http://www.fao.org/3/a-i5896e.pdf>

FAO and WTO. 2017. Trade and Food Standards. FAO, Rome <http://www.fao.org/3/a-i7407e.pdf>

FAO et OMC. 2017. « Le Commerce et les Normes Alimentaires » FAO, Rome <http://www.fao.org/3/i7407fr/i7407FR.pdf>

FAO Regional Conference for Africa "Trends and issues in food and agriculture for national and regional action in the context of the SDGs" 29th Session, March 2016 ARC/16/3 (Abidjan, Côte d'Ivoire, 4-8 April 2016) http://www.afdb.org/fileadmin/uploads/afdb/Documents/Generic-Documents/Keynote_Speech_delivered_by_Dr._Akinwumi_A._Adesina_President_of_the_African_Development_Bank_Group_at_the_Africa_Green_Revolution_Forum_Nairobi__8_September_2016.pdf

FAO and WHO. 2016. Codex AI "Understanding Codex" <http://www.fao.org/3/a-i5667e.pdf>

FAO. 2016. "Influencing food environments for healthy diets". FAO, Rome <http://www.fao.org/3/a-i6484e.pdf>

FAO and WHO. 2016. "Risk communication applied to food safety handbook" FAO. Rome <http://www.fao.org/3/a-i5863e.pdf>

FAO. 2013. "Assuring Food Safety and Quality: Guidelines for Strengthening National Food Control Systems" <http://www.fao.org/docrep/006/y8705e/y8705e00.htm>

FAO. 2007. Guidelines "Good Agricultural Practices for Family Agriculture" <http://www.fao.org/3/a-a1193e.pdf>

FAO and WHO. 2006. "FAO/WHO Guidance to Governments on the Application of HACCP in Small and/or Less-Developed Food Businesses" http://www.fao.org/tempref/AG/agn/food/haccp_061031_.pdf

FAO. 2006. "Food Safety Certification" FAO, Rome <ftp://ftp.fao.org/docrep/fao/008/ag067e/ag067e00.pdf>

FAO and WTO. 2003. "Assuring Food Safety and Quality. Guidelines for Strengthening National Food Control Systems" <http://www.fao.org/3/a-y8705e.pdf>

OMS et FAO. 2003. « Garantir la sécurité sanitaire et la qualité des aliments. Directives pour le renforcement des systèmes nationaux de contrôle alimentaire » http://www.wpro.who.int/foodsafety/documents/docs/French_Guidelines_Food_control.pdf

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

Badiane, Ousmane, Odjo, Sunday, and Collins, Julia (Eds). 2018. Africa Agriculture Trade Monitor Report 2018. Washington, DC: International Food Policy Research Institute (IFPRI). <http://www.resakss.org/sites/default/files/AATM-Web-Final-28-08-18.pdf>

Brown, Lynn R. 2018. Aflatoxins in food and feed: Impacts risks, and management strategies. GCAN Policy Note 9. Washington, DC: International Food Policy Research Institute (IFPRI). <http://cdm15738.contentdm.oclc.org/cdm/ref/collection/p15738coll2/id/132734>

Hoffmann, Vivian; and Jones, Kelly M. 2018. Improving food safety on the farm: Experimental evidence from Kenya on agricultural incentives and subsidies as public health investments. IFPRI Discussion Paper 1746. Washington, DC.: International Food Policy Research Institute (IFPRI). <http://ebrary.ifpri.org/cdm/ref/collection/p15738coll2/id/132768>

Grace, Delia; Alonso, Silvia; Mutua, Florence; Hoffmann, Vivian; Lore, Tezira; and Karugia, Joseph. 2018. Food safety in Kenya: Focus on dairy. Project Note. Washington, D.C.: International Food Policy Research Institute (IFPRI). <http://ebrary.ifpri.org/cdm/ref/collection/p15738coll2/id/132372>

International Food Policy Research Institute (IFPRI). 2018. Food Industries for People & Planet: A new research agenda. <http://ebrary.ifpri.org/cdm/ref/collection/p15738coll2/id/132349>

Yen, Eric; Hoffman, Vivian; Grace, Delia; Karugia, Joseph; and Aguda, Rikki. 2018. Food safety in Kenya: Focus on fruits and vegetables. Project Note. Washington, DC: International Food Policy Research Institute (IFPRI). <http://ebrary.ifpri.org/cdm/ref/collection/p15738coll2/id/132321>

Hoffmann, Vivian; and Jones, Kelly M. 2017. Incentives and subsidies for farmer adoption of food safety technologies. Project Note. Washington, D.C.: International Food Policy Research Institute (IFPRI). <http://ebrary.ifpri.org/cdm/ref/collection/p15738coll2/id/131126>

Hoffmann, Vivian; and Moser, Christine. 2017. You get what you pay for: the link between price and food safety in Kenya. *Agricultural Economics* 48(4): 449-458. <https://doi.org/10.1111/agec.12346>

Ragasa, Catherine; Thornsby, Suzanne; and Joshi, Satish. 2017. Dynamics of EU food safety certification: a survival analysis of firm decisions. *Agricultural and Food Economics* 5(1): 11 <https://doi.org/10.1186/s40100-017-0080-2>

Unnevehr, Laurian J. and Ronchi, Loraine. 2014. Food safety and developing markets: Research findings and research gaps. IFPRI Discussion Paper 1376. Washington, D.C.: International Food Policy Research Institute (IFPRI). <http://ebrary.ifpri.org/cdm/ref/collection/p15738coll2/id/128359>

INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE

Grace, D., Alonso, S., Mutua, F., Roesel, K., Lindahl, J. and Amenu, K. 2018. Food safety investment expert advice: Burkina Faso, Ethiopia, Nigeria. Nairobi, Kenya: ILRI. <https://cgspace.cgiar.org/bitstream/handle/10568/91963/Food%20safety%20investment%20Mar%20%20General.pdf?sequence=1&isAllowed=y>

Grace, D. 2017. Food safety in developing countries: research gaps and opportunities. White paper. Nairobi, Kenya: ILRI. <https://bit.ly/2x4VZ4A>

Roesel, K., Grace, D., (eds). 2015. Food safety and informal markets- animal products in sub-Saharan Africa. 2015. Routledge Taylor & Francis Group, earthscan from Routledge ILRI <http://hdl.handle.net/10568/42438>

Roesel, K. et Grace, D. 2016. « Sécurité sanitaire des aliments et marchés informels: les produits d'origine animale en Afrique Subsaharienne » https://cgspace.cgiar.org/bitstream/handle/10568/79976/PR_FoodSafety_fr.pdf?sequence=5

INTERNATIONAL STANDARDS ORGANIZATION

ISO. 2018. "Food safety management - ISO 22000:2018" <https://www.iso.org/files/live/sites/isoorg/files/store/en/PUB100430.pdf>

ISO. 2017. "ISO and food" https://www.iso.org/files/live/sites/isoorg/files/archive/pdf/en/iso_and_food_en.pdf

WORLD HEALTH ORGANIZATION

WHO. 2015. "WHO estimates of the global burden of foodborne diseases: Foodborne diseases burden epidemiology reference group 2007-2015" http://www.who.int/iris/bitstream/10665/199350/1/9789241565165_eng.pdf?ua=1

WHO. 2012. Guidelines for Developing and Implementing a National Food Safety Policy and Strategic Plan. World Health Organization, Geneva <https://afro.who.int/sites/default/files/2017-06/developing-and-implementing-national-food--main-english-final.pdf>

OMS. 2012. « Guide pour l'élaboration et la mise en œuvre d'une politique et d'un plan stratégique nationaux en matière de sécurité sanitaire des aliments » <https://afro.who.int/sites/default/files/2017-06/guide-d%27elaboration.pdf>

OTHER SOURCES

African Union Commission. 2018. "First progress report of the Chairperson of the Commission on Food Safety" <http://www.peaceau.org/uploads/paca-report-to-the-prc-food-safety.pdf>

Brookings Institute. 2016. "Foresight Africa: Top priorities for the continent in 2016" https://www.brookings.edu/wp-content/uploads/2016/01/foresightafrica2016_ch6-3.pdf



- Calder, P.C. and Jackson, A.A. 2000. "Undernutrition, infection and immune function." *Nutrition Research Reviews*, 2000. 13:3-29.
<https://doi.org/10.1079/095442200108728981>
- Compendium - Final Report Zero Hunger Challenge Working Groups
<http://www.un.org/en/zerohunger/pdfs/Renewed%20ZHC%20ANs-3%20Systems-Ebook.pdf>
- Cunningham-Rundles, S. et al. 2005. "Mechanisms of nutrient modulation of the immune response". *The Journal of Allergy and Clinical Microbiology*, 2005. 115(6): 1119-1128.
<https://doi.org/10.1016/j.jaci.2005.04.036>
- Egorov, A.I. et al., 2010. "The effect of *Helicobacter pylori* infection on growth velocity in young children from poor urban communities in Ecuador". *International Journal of Infectious Diseases*, 2010. 14(9):788-791.
<https://www.sciencedirect.com/science/article/pii/S1201971216311304>
- Fernandes TH., et al. "Nutrition, Food Safety and Quality in Sub-Saharan Africa". *EC Nutrition* 9.6 (2017): 243-255.
<https://www.econicon.com/ecnu/pdf/ECNU-09-00322.pdf>
- Global Panel. 2016. *Assuring Safe Food Systems: Policy Options For a Healthier Food Supply*. Policy Brief. London, UK: Global Panel on Agriculture and Food Systems for Nutrition.
<http://glopan.org/sites/default/files/Food-Safety-Policy-Brief.pdf>
- Grace, D., Dominguez-Salas, P., Alonso, S., Fahrion, A., Haesler, B., Heilmann, M., Hoffmann, V., Kang'ethe, E., Roesel, K. and Lore, T. 2018. *Food safety metrics relevant to low and middle income countries: Working paper*. Agriculture, Nutrition and Health Academy, Food Safety Working Group. London, UK: Innovative Methods and Metrics for Agriculture and Nutrition Actions programme.
<http://hdl.handle.net/10568/92507>
- Grace, D. . 2015. "Food Safety in Developing Countries: An Overview" *Agrilinks*
https://www.agrilinks.org/sites/default/files/resource/files/EoD_Learning_Resource_Food%20Safety_updFeb2016-1.pdf
- Grace, D. 2015. *Food Safety in Low and Middle Income countries*. *International Journal of Environmental Research and Public Health*, 2015. 12(9):10490-10507.
<http://www.mdpi.com/1660-4601/12/9/10490/pdf>
- Gregor, M.F. and Hotamisligil, G.S. 2011. "Inflammatory Mechanisms in Obesity". *Annual Review of Immunology*, 2011. 29: 415-445.
<https://doi.org/10.1146/annurev-immunol-031210-101322>
- Groop, L.C., et al. 1992. "Effect of insulin on oxidative and nonoxidative pathways of free fatty acid metabolism in human obesity". *American Journal of Physiology- Endocrinology and Metabolism*, 1992. (263) 1.
<https://doi.org/10.1152/ajpendo.1992.263.1.E79>
- IFAD, 2016. "Rural-urban linkages and food systems in sub-Saharan Africa The rural dimension"
<https://www.ifad.org/documents/10180/b9021802-e3f7-4bd5-b0ea-760a8fbaabc2>
- International Trade Centre. 2011. "The Impacts of Private Standards on Global Value Chains." Geneva: ITC, 2011. x, 41 p. (Literature Review Series on the Impacts of Private Standards; Part I) Doc. No. MAR-11-198.E
<http://www.intracen.org/WorkArea/DownloadAsset.aspx?id=37609>
- M. Uyttendaele, L. Jacxsens, S. Van Boxtael. 2014. "4 - Issues surrounding the European fresh produce trade: a global perspective", Editor(s): J. Hoorfar, *Global Safety of Fresh Produce*, Woodhead Publishing, 2014, Pages 33-51
<https://doi.org/10.1533/9781782420279.1.33>
- Malte Ehrich, Fatima Kareem, Dr. Amjad Masood, Dr. Anna Müller. 2015. "Obstacle or opportunity? Food safety standards as a challenge for developing countries". *Global Food Policy Brief* Nr. 1 2015
<https://bit.ly/2CDMxL3>
- Manning, L and Soon, JM .2016. "Food Safety, Food Fraud, and Food Defense: A Fast Evolving Literature" Vol. 81, Nr. 4, 2016 *Journal of Food Science*.
<https://doi.org/10.1111/1750-3841.13256>
- Michigan State University "Regulating the Quality and Safety of Foods"
<https://msu.edu/course/fsc/421/Powerpoints/Food%20Safety%20and%20Quality.ppt>
- Morse, Tracy D. and Masuku, Humphreys and Rippon, Sarah and Kubwalo, Hudson (2018) *Achieving an integrated approach to food safety and hygiene—meeting the sustainable development goals in Sub-Saharan Africa*. Sustainability, 10 (7). ISSN 2071-1050
https://strathprints.strath.ac.uk/64746/1/Morse_etal_Sustainability_2018_Achieving_an_integrated_approach_to_food_safety_and_hygiene.pdf

OECD. 2009. Interaction of Public and Private Standards in the food Chain <http://www.oecd.org/tad/agricultural-trade/45013504.pdf>

Oliver von Hagen, Joseph Wozniak, Mathieu Lamolle. 2014. « Normes privées relatives à la sécurité et à la qualité des aliments dans le commerce international » 16pg http://www.iamm.ciheam.org/ress_doc/opac_css/doc_num.php?explnum_id=11370

Pinstrup-Andersen, P. 2011. "The food system and its interaction with human health and nutrition". 2020 Conference Brief 2011, No.13. Washington, D.C.:IFPRI. <http://ebrary.ifpri.org/utils/getfile/collection/p15738coll2/id/124820/filename/124821.pdf>

PwC. 2016 "Food Fraud Vulnerability Assessment and Mitigation: Are you doing enough to prevent food fraud?" <https://www.pwc.com/gx/en/services/food-supply-integrity-services/assets/pwc-food-fraud-vulnerability-assessment-and-mitigation-november.pdf>

Robinson, E. and Humphrey, J. 2015. "Better Nutrition for the Poor through Informal Markets" IDS Policy Briefing 89 Publisher IDS http://opendocs.ids.ac.uk/opendocs/bitstream/123456789/5866/1/PB89_AGID14_BetterNutrition_online.pdf

Smith, L.E. et al. 2012. "Food chain mycotoxin exposure, gut health, and impaired growth: A conceptual framework". *Advances in Nutrition*, 2012. 3:526-531. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3649721/>

Staatz, J. and F. Hollinger (2016), "West African Food Systems and Changing Consumer Demands", *West African Papers*, No. 04, OECD Publishing, Paris. <http://dx.doi.org/10.1787/b165522b-en>

Townsend, Robert; Jaffee, Steven M.; Hoberg, Yurie Tanimichi; Htenas, Aira Maria; Shekar, Meera; Hyder, Ziauddin; Gautam, Madhur; Kray, Holger A.; Ronchi, Loraine; Hussain, Sarwat; Elder, Leslie K.; Moses, Eugene. 2016. *Future of food : shaping the global food system to deliver improved nutrition and health (English)*. Washington, D.C. : World Bank Group. <http://documents.worldbank.org/curated/en/474831468186561685/Future-of-food-shaping-the-global-food-system-to-deliver-improved-nutrition-and-health>



Websites

African Food Safety Network (AFoSaN)
<http://www.africanfoodsafetynetwork.org/>

EUROPEAN UNION

European Centre for Disease Prevention and Control
<https://ecdc.europa.eu/en/home>

European Commission
https://ec.europa.eu/food/overview_en

European Commission Directorate for Health and Food Safety (DG SANTE)
https://ec.europa.eu/food/safety_en

European Food Safety Authority (EFSA)
<http://www.efsa.europa.eu/>

Food Quality & Safety (publication)
<https://www.foodqualityandsafety.com/>

Food Safety and Quality Assurance-Department of Agriculture, Forestry and Fisheries (DAFF) (South Africa)
<http://www.daff.gov.za/daffweb3/Branches/Agricultural-Production-Health-Food-Safety/Food-Safety-Quality-Assurance>

Food Standards Agency (UK FSA)
<https://www.food.gov.uk/>

Global Food Safety Partnership (GFSP)
<https://www.gfsp.org/>

ISO 22000 family - Food safety management
<https://www.iso.org/iso-22000-food-safety-management.html>

Safe Food, Fair Food in Africa – ILRI
<https://safefoodfairfood.ilri.org/>

UNITED NATIONS

Codex Alimentarius
<http://www.fao.org/fao-who-codexalimentarius/home/en/>

Food and Agriculture Organisation (FAO)
<http://www.fao.org/food/food-safety-quality/home-page/en/>

World Health Organisation – Food Safety
<http://www.who.int/foodsafety/en/>

US Food and Drug Administration
<https://www.fda.gov/>

US Department of Agriculture – Food Safety and Inspection Service
<https://www.fsis.usda.gov/wps/portal/fsis/home>

OTHER WEBSITES

Consumer Goods Council of South Africa (CGCSA)
<https://www.cgcsa.co.za/>

Food Navigator (news)
<https://www.foodnavigator.com/tag/keyword/Food/Food%20safety>

GAIN
<https://www.gainhealth.org/>

Endnotes

- 1 FAO and WHO. 2016. Codex AI "Understanding Codex" <http://www.fao.org/3/a-i5667e.pdf>
- 2 WHO. 2015. "WHO estimates of the global burden of foodborne diseases: Foodborne diseases burden epidemiology reference group 2007-2015" http://www.who.int/iris/bitstream/10665/199350/1/9789241565165_eng.pdf?ua=1
- 3 WHO. 2013. Advancing Food Safety Initiatives. Strategic Plan for Food Safety Including Foodborne Zoonoses 2013-2022 http://apps.who.int/iris/bitstream/handle/10665/101542/9789241506281_eng.pdf?sequence=1&isAllowed=y&ua=1
- 4 Ibid.
- 5 FAO and WHO. 2016.
- 6 FAO. 2013. "Assuring Food Safety and Quality: Guidelines for Strengthening National Food Control Systems" <http://www.fao.org/docrep/006/y8705e/y8705e00.htm>
- 7 Fernandes TH., et al. "Nutrition, Food Safety and Quality in Sub-Saharan Africa". *EC Nutrition* 9.6 (2017): 243-255. <https://www.econicon.com/ecnu/pdf/ECNU-09-00322.pdf>
- 8 Codex Alimentarius. FAO-WHO. <http://www.fao.org/fao-who-codexalimentarius/en/>
- 9 WHO Africa. Food Safety Programme. <https://www.afro.who.int/health-topics/food-safety>
- 10 World Health Organization 2013. Advancing Food Safety Initiatives. Strategic Plan for Food Safety Including Foodborne Zoonoses 2013-2022 http://apps.who.int/iris/bitstream/handle/10665/101542/9789241506281_eng.pdf?sequence=1&isAllowed=y&ua=1
- 11 From farm to fork: safe and healthy food for everyone. EU. 2014.
- 12 Food Safety in the EU. https://europa.eu/european-union/topics/food-safety_en
- 13 HLTF. The Zero Hunger Challenge. Advisory note for action. All food systems are sustainable. <http://www.un.org/en/issues/food/taskforce/wg3.shtml> <http://www.un.org/en/zerohunger/pdfs/Renewed%20ZHC%20ANs-3%20Systems-Ebook.pdf> See also: FAO. 2016 "Influencing food environments for healthy diets". FAO, Rome. <http://www.fao.org/3/a-i6484e.pdf>
- 14 FAO. 2013.
- 15 "It's time for fixed definitions for food fraud and food integrity" Codex Alimentarius (accessed September 2018). <http://www.fao.org/fao-who-codexalimentarius/news-and-events/news-details/en/c/897028/>
- 16 "Food Fraud" European Commission (accessed September 2018). https://ec.europa.eu/food/safety/food-fraud_en
- 17 PwC. 2016 "Food Fraud Vulnerability Assessment and Mitigation: Are you doing enough to prevent food fraud?" <https://www.pwc.com/gx/en/services/food-supply-integrity-services/assets/pwc-food-fraud-vulnerability-assessment-and-mitigation-november.pdf>
- 18 Fernandes TH., et al. 2017.
- 19 Foodborne Disease Burden Epidemiology Reference Group (FERG).
- 20 Grace, D., Dominguez-Salas, P., Alonso, S., Fahrion, A., Haesler, B., Heilmann, M., Hoffmann, V., Kang'ethe, E., Roesel, K. and Lore, T. 2018. Food safety metrics relevant to low and middle income countries: Working paper. Agriculture, Nutrition and Health Academy, Food Safety Working Group. London, UK: Innovative Methods and Metrics for Agriculture and Nutrition Actions programme. <http://hdl.handle.net/10568/92507>
- 21 Roesel, K., Grace, D., (eds). 2015. Food safety and informal markets- animal products in sub-Saharan Africa. 2015. Routledge Taylor & Francis Group, earthscan from Routledge ILRI. Grace, D. 2015. Food Safety in Low and Middle Income countries. International Journal of Environmental Research and Public Health, 2015. 12(9):10490-10507.
- 22 WHO. 2015
- 23 Grace, D. 2017. "White Paper. Food safety in developing countries: research gaps and opportunities". Feed the Future, IFPRI, USAID.
- 24 The State of Food security and nutrition in the World 2018. Building climate resilience for food security and nutrition. FAO, IFAD, UNICEF, WFP, WHO. <http://www.who.int/nutrition/publications/foodsecurity/state-food-security-nutrition-2018-en.pdf?ua=1>
- 25 Global Panel. 2016. Assuring Safe Food Systems: Policy Options For a Healthier Food Supply. Policy Brief. London, UK: Global Panel on Agriculture and Food Systems for Nutrition.
- 26 Per Pinstrup-Andersen, The food system and its interaction with human health and nutrition. 2020 Conference Brief 2011, No.13. Washington, D.C.:IFPRI. Egorov, A.I. et al., The effect of *Helicobacter pylori* infection on growth velocity in young children from poor urban communities in Ecuador. International Journal of Infectious Diseases, 2010. 14(9):788-791.
- 27 WHO. 2015. Calder, P.C. and Jackson, A.A. Undernutrition, infection and immune function. Nutrition Research Reviews, 2000. 13:3-29. Cunningham-Rundles, S. et al. Mechanisms of nutrient modulation of the immune response. The Journal of Allergy and Clinical Microbiology, 2005. 115(6): 1119-1128.



- 28 Smith, L.E. et al. Food chain mycotoxin exposure, gut health, and impaired growth: A conceptual framework. *Advances in Nutrition*, 2012. 3:526-531.
- Gregor, M.F. and Hotamisligil, G.S., Inflammatory Mechanisms in Obesity. *Annual Review of Immunology*, 2011. 29: 415-445.
- Groop, L.C., et al., Effect of insulin on oxidative and nonoxidative pathways of free fatty acid metabolism in human obesity. *American Journal of Physiology- Endocrinology and Metabolism*, 1992. (263) 1.
- 29 Laurian J. Unnevehr, Ed., Delia grace, Ed. IFPRI. 2020 Vision Focus. 2013.
- 30 GAIN. <https://www.gainhealth.org/knowledge-centre/food-safety-why-we-need-to-care/>
- 31 FAO and WHO. 2006. "FAO/WHO Guidance to Governments on the Application of HACCP in Small and/or Less-Developed Food Businesses". http://www.fao.org/tempref/AG/agn/food/haccp_061031_.pdf
- 32 Commission Notice on the implementation of food safety management systems covering prerequisite programs (PRPs) and procedures based on the HACCP principles, including the facilitation/ flexibility of the implementation in certain food businesses (C/2016/4608) <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52016XC0730%2801%29>
- 33 FAO. 2013
- 34 Robert V. Tauxe. International Conference on Emerging Infectious Diseases 2000. Food Safety and Irradiation: protecting the public from foodborne infections. Centers for Disease Control and Prevention, Atlanta, Georgia, USA. <https://wwwnc.cdc.gov/eid/article/7/7/01-7706-f1>
- 35 Hong Kong Centre for Food Safety (accessed September 2018). https://www.cfs.gov.hk/english/multimedia/multimedia_pub/multimedia_pub_fsf_01_02.html
- 36 Fernandes TH., et al. 2017.
- 37 WHO. Food Safety Key facts. <http://www.who.int/en/news-room/fact-sheets/detail/food-safety>
- 38 FAO. 2017. "Food Safety Risk Management: Evidence-Informed Policies and Decisions, Considering Multiple Factors" FAO Guidance Materials. FAO, Rome. <http://www.fao.org/3/i8240en/i8240EN.pdf>
- 39 FAO, 2012.
- 40 *ibid*.
- 41 WHO. Risk Assessment. <http://www.who.int/foodsafety/risk-analysis/riskassessment/en/>
- 42 FAO. 2017.
- 43 FAO and WHO. 2016. "Risk communication applied to food safety handbook" <http://apps.who.int/iris/bitstream/10665/250083/1/9789241549448-eng.pdf?ua=1>
- 44 ISO. 2018. "Food safety management - ISO 22000:2018" <https://www.iso.org/files/live/sites/isoorg/files/store/en/PUB100430.pdf>
- ISO. 2017. "ISO and food". https://www.iso.org/files/live/sites/isoorg/files/archive/pdf/en/iso_and_food_en.pdf
- 45 FAO. 2007. Guidelines "Good Agricultural Practices for Family Agriculture". <http://www.fao.org/3/a-a1193e.pdf>
- 46 FAO and PAHO. 2017. Food Handlers Manual. Instructor. Washington, DC : PAHO, 2017. <http://www.fao.org/3/a-i5896e.pdf>
- 47 FAO and WHO. 2013.
- 48 M. Uyttendaele, L. Jacxsens, S. Van Boxtael. 2014. "4 - Issues surrounding the European fresh produce trade: a global perspective", Editor(s): J. Hoorfar, Global Safety of Fresh Produce, Woodhead Publishing, 2014, Pages 33-51. <https://doi.org/10.1533/9781782420279.1.33>.
- 49 Global G.A.P.. The Worldwide Standard for Good Agricultural Practices. https://www.globalgap.org/uk_en/
- 50 Global Food Policy Brief Nr. 1 2015 "Obstacle or opportunity? Food safety standards as a challenge for developing countries". Malte Ehrich, Fatima Kareem, Dr. Amjad Masood, Dr. Anna Müller <https://bit.ly/2CDMxL3>
- 51 OECD. 2009. Interaction of Public and Private Standards in the food Chain <http://www.oecd.org/tad/agricultural-trade/45013504.pdf>
- 52 FAO, Food Safety Certification, 2006, <ftp://ftp.fao.org/docrep/fao/008/ag067e/ag067e00.pdf>
- 53 These quality meta-systems are embedded in voluntary public standards at the national or international level (e.g. ISO 22000), while others are proprietary private standards developed by standards bodies (e.g. SQF - Safe Quality Food 2000) or by individual food companies (e.g. Tesco's Nature's Choice). Some of the metasystems that started out as voluntary codes of good practice have now been incorporated into public regulations, representing a further blurring of the line of demarcation between public and private standards. An example is the inclusion of HACCP as part of the regulatory requirements for meat and meat products in the United States, Canada and the EU. The success of private voluntary standards in the food sector has led to changes in standard setting processes, including the emergence of coalitions or consortia of firms for setting private standards. One result of adopting higher private standards for product differentiation and competitive positioning in markets or to guard against product tort liability has been an increase in transaction costs for individual firms that established their own standards. As a result, pressures emerged from such firms or the developments of collective and harmonised private standards through industry organisations and groups of firms [e.g. British Retail Consortium (BRC), International Food Standards (IFS)]. OECD, Interaction of Public and Private Standards, cit.
- 54 WHO estimates of the Global burden of foodborne diseases. 2015 http://www.who.int/foodsafety/areas_work/foodborne-diseases/infographics_afro_en.pdf
- 55 Grace, D., Kang'ethe, E., Bonfoh, B., Roesel, K. and Makita, K. 2014. Food safety policy in 9 African countries. Presented at the 4th annual Leverhulme Centre for Integrative Research on Agriculture and Health (LCIRAH) conference, London, UK, 3-4 June 2014. Nairobi, Kenya: ILRI.

- 56 Badiane, Ousmane, Odjo, Sunday, and Collins, Julia (Eds). 2018. Africa Agriculture Trade Monitor Report 2018. Washington, DC: International Food Policy Research Institute (IFPRI). <http://www.resakss.org/sites/default/files/AATM-Web-Final-28-08-18.pdf>
- 57 IFAD, 2016. "Rural-urban linkages and food systems in sub-Saharan Africa The rural dimension" <https://www.ifad.org/documents/10180/b9021802-e3f7-4bd5-b0ea-760a8fbaabc2>
- 58 Badiane, O. 2011. *Agriculture and Structural Transformation in Africa*. Stanford Symposium Series on Global Food Policy and Food Security in the 21st Century. Stanford, CA: Freeman Spogli Institute for International Studies.
- 59 Staatz, J. and F. Hollinger (2016), "West African Food Systems and Changing Consumer demands", *West African Papers*, No. 04, OECD Publishing, Paris. <http://dx.doi.org/10.1787/b165522b-en>
- 60 *Ibid.*
- 61 Grace, Delia; Alonso, Silvia; Mutua, Florence; Hoffmann, Vivian; Lore, Tezira; and Karugia, Joseph. 2018. Food safety in Kenya: Focus on dairy. Project Note. Washington, D.C.: International Food Policy Research Institute (IFPRI). <http://ebrary.ifpri.org/cdm/ref/collection/p15738coll2/id/132372>
- 62 Badiane, O. (ed); Odjo, S.P. (ed); Collins, J. Africa Agriculture Trade Monitor (AATM) 2018. AGRODEP; CTA; IFPRI; ReSAKSS. <https://publications.cta.int/en/publications/publication/2035/>
- 63 CEN-SAD (Community of Sahel-Saharan States), COMESA (Common Market for Eastern and Southern Africa), EAC (East African Community), ECCAS (Economic Community of Central African States), ECOWAS (Economic Community of West African States), IGAD (Intergovernmental Authority on Development), SADC (Southern African Development Community) and UMA (Arab Maghreb Union)
- 64 Brookings Institute (2016) "Foresight Africa: Top priorities for the continent in 2016" https://www.brookings.edu/wp-content/uploads/2016/01/foresightafrica2016_ch6-3.pdf
- 65 African Development Bank 2016 http://www.afdb.org/fileadmin/uploads/afdb/Images/high_5s/Job_youth_Africa_Job_youth_Africa.pdf
- 66 FAO Regional Conference for Africa "Trends and issues in food and agriculture for national and regional action in the context of the SDGs" 29th Session, March 2016 ARC/16/3 (Abidjan, Côte d'Ivoire, 4-8 April 2016)
- 67 AFDB 2016. http://www.afdb.org/fileadmin/uploads/afdb/Documents/Generic-Documents/Keynote_Speech_delivered_by_Dr._Akinwumi_A._Adesina_President_of_the_African_Development_Bank_Group_at_the_Africa_Green_Revolution_Forum_Nairobi__8_September_2016.pdf
- 68 ICT Update. Unlocking the potential of blockchain for agriculture. September 2018. <http://ictupdate.cta.int/wp-content/uploads/sites/5/2018/08/ICTUpdate-88-EN.pdf>
- 69 Grace, Delia; McDermott, John. 2015. Food safety: Reducing and managing food scares. In 2014-2015 Global food policy report. Chapter 6 Pp. 41-50. Washington, D.C.: International Food Policy Research Institute (IFPRI). <http://ebrary.ifpri.org/cdm/ref/collection/p15738coll2/id/129080>
- 70 <http://www.foresight.cnr.it/foresight/contributions/nano-technologies%20and%20ICT%20in%20processing,%20packaging,%20nutrition-supplements.pdf>
- 71 ICT Update. <http://ictupdate.cta.int>
- 72 Andreas Kamilaris, Francesc Xavier Prenafeta-Boldú and Agusti Fonts work at the Institute of Agrifood Research and Technology (IRTA) in Barcelona, Spain. ICT Update. Unlocking the potential of blockchain for agriculture. September 2018. <http://ictupdate.cta.int/wp-content/uploads/sites/5/2018/08/ICTUpdate-88-EN.pdf>
- 73 WHO. FAO. Government Canada. Food industries.

Food safety: a critical part of the food system in Africa



BRUSSELS RURAL DEVELOPMENT BRIEFINGS

A SERIES OF MEETINGS ON ACP-EU DEVELOPMENT ISSUES

Along with our partners in this joint initiative, the European Commission (DG DEVCO), the ACP Secretariat and ACP Group of Ambassadors, CONCORD and various media, we at CTA look forward to welcoming you at our next Brussels Development Briefing.

Never miss the latest daily news on key ACP-EU programmes and events in Brussels related to agriculture and rural development with our Blog brussels.cta.int

For more information Email: brussels.briefings@cta.int Tel: + 32 (0) 2 513 74 36

www.brusselsbriefings.net

