National food safety control systems in South Sudan

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September 2020

Acknowledgements

This report was funded in part by the generous support of the American people through the United States Agency for International Development (USAID) and the Feed the Future Innovation Lab for Food Safety under Cooperative Agreement No. 7200AA19LE00003. The contents are the responsibility of the authors and do not necessarily reflect the views of USAID or the U.S. government.

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Abbreviations and acronyms

ASF	animal-source food
AU	African Union
CPD	Continuous Professional Development
DFCA	Drugs and Food Control Authority
EAC	East African Community
FAO	Food and Agriculture Organization of the United Nations
FV	fruits and vegetables
GAP	Good Agricultural Practice
GDP	Gross Domestic Product
GHP	Good Hygienic Practice
GMO	genetically modified organism
GMP	Good manufacturing practice
HACCP	Hazards Analysis Critical Control Point
ILRI	International Livestock Research Institute
IPPC	International Plants Protection Convention
ISO	International Standardisation Organisation
MAFS	Ministry of Agriculture and Food Security
MLF	Ministry of Livestock and Fisheries
MoH	Ministry of Health
MTI	Ministry of Trade and Industry
MWRI	Ministry of Water Resources and Irrigation
OIE	World Organisation for Animal Health
QMS	Quality Management Systems
SPS	Sanitary and phytosanitary
SSNBS	South Sudan National Bureau of Standards

Summary

The situation analysis of food safety control systems of South Sudan was carried out from November 2019 to April 2020 by the country team that previously attended the 'Food Safety Training Workshop for Animal-Source Foods and Fresh Fruits and Vegetables' at the International Livestock Research Institute (ILRI) campus in Addis Ababa from 12 to 23 August 2019. The main objective of conducting this study was to understand the present food safety system situation of the country in order to make suggestions for improvements to stakeholders. The information used for the work was derived from a variety of sources including food laws, policies and consultation with the main food safety stakeholders and responsible institutions. Other sources of information included health map, students' theses, newspapers, studies on the national burden of foodborne diseases and records from hospitals and clinics.

This situation analysis consists of four sections: policy, products, food safety challenges or problems, and priorities. The report covers policies, stakeholder analysis, food safety risk assessment and food safety policies and legislations concerning animal-source food (ASF) and fruits and vegetables (FV). The aim of the policy section is to understand the level of stakeholder engagement in implementing the food safety mandate while the product section deals with the current level of consumption of ASF and FV and the production, export and import aspects of these foods. The focus of the product section is mainly on important sources of animal proteins and niche agro-produce that are specific to South Sudan. In the food safety problems section, the foodborne diseases of public health importance are identified as well as their methods of detection and management. In this analysis, *Vibrio cholerae* and non-typhoidal *Salmonella* were the major public health hazards causing foodborne diseases in South Sudan. The priorities section emphasizes the top five food safety problems the country faces. Some of the practices identified include the use of untreated stream water, collection of plastic bottles from rubbish heaps for reuse, use of dishcloths to clean many utensils (which may easily transfer contaminants from one utensil to another), frequent eating of bush meat and drinking raw or uncooked blood.

Within the food safety system framework, different institutions work independently with different work cultures, leading to fragmentation and incoherence of efforts. The ambiguities of different policies had caused the fragmentation of the food safety system. For instance, the following government institutions all work on food safety: Ministries of Health, Agriculture and Food Security, Livestock and Fisheries, Trade and Industry, South Sudan National Bureau of Standards, Juba City Council, and the three public universities (University of Juba, University of Upper Nile and University of Bahr Ghazal). This haphazard manner of food safety implementation indicates that South Sudan lacks a singular unified food safety body with a mandate to coordinate efforts from various government regulatory agencies. In support of food safety implementation, laboratories for food testing and surveillance programs have been established but face technical and operational challenges due to limited resources and expertise. Available laboratories do not have the capacity to conduct comprehensive testing of foods and other products to support the country's food safety system.

1. Introduction

The Republic of South Sudan is the newest country in the world, having gained independence in July 2011. A landlocked country, it borders Ethiopia to the east, Kenya and Uganda to the south, the Democratic Republic of Congo to the southwest and the Central African Republic to the west and covers an area of 644,329 square kilometres. South Sudan's population is approximately 12.3 million people.[1] It is a multi-ethnic nation comprising about 64 different ethnic groups. Most of its people are Christians, one-third are Muslims and some follow traditional religions. About 44% of the population is below the age of 15 years, with a median age of 17 years.[2]

South Sudan had one of the longest civil wars in modern African history (since 1955) which destroyed most of the infrastructure in the country. Despite being the newest country in the world, conflict has made South Sudan one of the poorest countries in the world. The country is ranked 187th out of 189 countries on the Human Development Index. South Sudan has an oil-dependent economy characterized by high payment deficit. For example, over 90% of the food consumed in the country is imported. The decline in oil price has further deepened the economic hardship in the country. Poverty levels have worsened from about 44.7% in 2011 to more than 82.3% in 2016.[3]

Agriculture is the main source of income for more than 85% of the population. About 71% of the 644,329 square kilometres of South Sudan is suitable for agriculture, 24% is forest and the remaining 5% is arid/semi-arid. However, the agriculture sector, which is supposed to be the engine of growth, continues to fail to meet its production potential as a result of sustained conflict, associated with population displacement, unpredictable and poor weather patterns, crop pests and diseases. These difficulties exacerbate food insecurity in the country.

South Sudan depends largely on import of goods, services and capital, mainly from Uganda, Kenya, other East African Community (EAC) states, the Democratic Republic of Sudan, Ethiopia and, to a minimal extent, the Democratic Republic of Congo and the Central African Republic. The country imports practically all its needs, including food and fuel which vastly exceed exports.[4]

Hunger and malnutrition have remained rampant, resulting in limited agricultural activities leading to insufficient food supplies and consumption. The greater population of the country depends on food aid which is often inadequate to meet human food needs. As a result, majority of the population have resorted to various coping mechanisms to address food insecurity such as eating of wild fruits, bush meat or foods whose safety has been compromised. Although a very small proportion of food is produced in the country, this limited food production has potential safety problems along the food supply chains of production, handling, packaging, processing and transportation.

Food safety problems extend to imported foods and are not limited to food produced in the country due to lack of efficient food safety control systems to monitor and remove unsafe foods from the markets. A surveillance system to detect and prevent foodborne diseases is crucial to any food control system. Diarrhoeal diseases arising from poor food safety are frequently reported and children bear the greatest burden. Cholera outbreaks are common due to consumption of contaminated food and water. South Sudan needs to address food safety issues along the farm-to-fork continuum.

The main objective of this situational analysis of food safety control systems was to understand the present food safety system situation in order to suggest areas of improvement to relevant stakeholders. The specific objectives were to review food safety information in the country and update the World Health Organization food safety situational analysis with more recent data, listing the data sources for each response. The

[1] https://www.worldometers.info/world-population/south-sudan-population/
[2] Central Intelligence Agency, The World Fact Book, last updated 26.09.2018, https://www.cia.gov/library/publications/the-world-factbook/geos/od.html
[3] https://data.worldbank.org/country/south-sudan
[4] Kuorwel, K.K., Lumori, C.S. and Andrew, A.K. 2018. Review of South Sudan's food safety status in relation to chemical contaminants. *MOJ Food Processing & Technology* 6(1): 113–120. https://doi.org/10.15406/mojfpt.2018.06.00153

findings will be collated and presented as an EAC position paper on the food safety situation in partner states, with appropriate recommendations for further action.

2. Methodology

Data were derived from a number of sources including food regulations and legislations, consumption, production, processing, import and export of ASF and FV. Data on food safety challenges and priorities based on public health importance were also analysed to understand the main problems affecting food safety systems. In addition, the role of stakeholders in food safety was considered crucial. To gather important views on food safety, a qualitative approach was used through focus group discussions and individual interviews. Additional information was collected from secondary sources.

3. Description of the food safety systems

The South Sudan food safety situational analysis consists of four sections: policy, products, problems and priorities.

3.1 Food safety stakeholders, legislations and regulations

3.1.1 Stakeholders in food safety

Table 1 shows the stakeholders involved in food safety in ASF and FV value chains, including the levels of the value chain where they operate and their specific mandates. This covers all institutions or organizations involved in food safety: ministries, agencies, local authorities, boards, committees, inspectorate services, development authorities, universities, institutes and the private sector. Most of these institutions have laws, regulations and policies which are either specifically on food safety or on some components of food safety.

Table 1: Stakeholders involved in food safety of ASF and FV value chains

Institution	Ministry or other authority	Where in the food chain	Mechanisms
Ministry of Agriculture and Food Security (Directorates of Plant Quarantine Unit under the Directorate of Plant Protection and Crop Production)	Agriculture	Farm level (especially commercial farms) and harvesting. There are number of departments involved ranging from horticulture, plant protection, extension etc.	Regulations on FV, including crop production and protection from diseases. The Ministry of Agriculture builds capacity of staff and provides extension services. South Sudan Agriculture Producers Union registers and trains farmers. The Directorate of Plant Protection inspects for pests and diseases.
Ministry of Livestock and Fisheries (Animal Production; Veterinary Medicine)	Livestock	Commercial farms, milk and egg collection sites and formal slaughter sites	Regulations on production of ASF. Surveillance of animal and zoonotic diseases and extension services to cattle herders on ways to combat these diseases.
Ministry of Health (Food and Drug Control; Public Health Laboratory; Boma Health Initiative)	Health	Display: markets, shops and kiosks Commercial farms, milk and egg collection sites and formal slaughter sites Farm level (especially commercial farms) and harvesting	Inspection of food and dietary food supplements.
Ministry of Trade and Industry	Trade and Industry	Border points for export and import of foods	Inspection and testing of food commodities.
South Sudan National Bureau of Standards	Trade and Industry	Distribution: transport for export, supermarkets and local retailers Display: markets, shops and kiosks	Inspection of food commodities, processes and products.

Institution	Ministry or other authority	Where in the food chain	Mechanisms
Juba City Council	Local Government	Display: markets, shops and kiosks, eating places, street food vendors	Inspection of food commodities for fitness for consumption. Sanctioning of closure of businesses for non-compliance with institutional frameworks.
University of Juba (School of Applied and Industrial Sciences; School of Natural Resources and Environmental Studies; School of Rural Development and Community Studies)	Higher Education and Scientific Research	All levels from production to harvesting, marketing and processing	Training of students in food science and technology, agriculture, animal production and environmental studies.
University of Upper Nile (College of Agriculture; College of Animal Production; College of Veterinary Sciences; College of Public Health)	Higher Education and Scientific Research	Capacity building and dissemination of information (extension)	Training of students in crop production, postharvest techniques, plant protection, animal production, dairy technology, meat production, poultry production, fish production, veterinary medicine, public health, water, hygiene and sanitation.
University of Bahr El Ghazal (College of Veterinary Sciences; College of Public Health)	Higher Education and Scientific Research	Training and extension service	Training of students in veterinary medicine, public health, water, hygiene and sanitation.
Food Security Council in the Office of President	Presidential Affairs	National level	Monitoring trends in food insecurity and recommending intervention strategies. Working with partners and donor organizations to identify food security gaps in the country.

3.2 Stakeholder analysis

The stakeholder analysis was conducted to understand the level of engagement in implementing food safety mandates and the impacts thereof. These depend on the policies and regulations formulated by the stakeholders. In South Sudan, many stakeholders have been identified and these institutions are either directly or indirectly involved in food safety.

As shown in Table 1, in South Sudan, several agencies share responsibilities for food safety, such as the South Sudan National Bureau of Standards (SSNBS),[5] regulatory agencies like the Drug and Food Control Authority (DFCA)[6] and Juba City Council besides the national ministries like the Ministry of Agriculture and Food Security (MAFS), the Ministry of Livestock and Fisheries (MLF) and the Ministry of Health (MoH). In South Sudan, activities related to food safety are mainly policy-based. For instance, institutions such as the SSNBS, DFCA, MLF and MAFS have quarantine units at the airport.

There are mixed responsibilities and mandates in the food safety system in South Sudan. There are no clear coordination mechanisms in policies and regulations among food safety stakeholders along the food production chain (see Table 1). For example, the Ministry of Agriculture and Food Security at the national level works independently on food production along the FV chain and likewise the Ministry of Livestock and Fisheries in the animal food production chain. SSNBS and DFCA have regulatory and inspectorate mandates and execute these in isolation. SSNBS formulates and enforces standards and inspects food and food products while the role of DFCA includes inspection of food supplements and medicines.

All the institutions listed above have other roles besides food safety. For instance, the Ministry of Health has the role of ensuring adequate health and nutrition to the general population in the country.[7] The role of the Ministry of Agriculture and Food Security includes food security and extension services. The Ministry

[5] South Sudan National Bureau of Standards Act (2012)
[6] South Sudan Drug and Food Control Authority Act (2012)
[7] South Sudan Ministry of Health. 2006. *National Health Policy 2016–2026*. Juba, South Sudan: Ministry of Health.

of Livestock and Fisheries has other responsibilities which include animal production, extension services and fisheries production.

The SSNBS has the role of ensuring food quality while the main role of DFCA is regulating of processes (licensing of manufacturers, importers and distributors of medicinal products). This includes evaluation and authorization of products for use locally, inspection and enforcement activities, quality control and testing of regulated products, surveillance and provision of therapeutic information services to ensure safety and quality and medicines. The local government authorities are involved in general hygiene and sanitation of premises selling food and food commodities. These roles are not conflicting but duplicated and they supplement one another. For example, the role of extension services is to educate farmers on good agricultural practices, focusing on general hygiene and sanitation practices which help in preventing contamination.

3.2.1 Food safety risk assessment

Currently, the concept of food safety is thriftily mentioned in the policies and regulations of the agencies in charge of food safety. Hence, food safety risk assessment is not mentioned in these policy documents since there is no single document that boldly describes food safety issues in the country. However, the team recommends that the food safety stakeholders use risk assessment approaches shown in Annex 1.

3.2.2 Food safety policies and legislations

This section addresses food safety policies and legislations in ASF and FV value chains. Most of these policies are either in their draft versions or not updated to reflect regulatory environments. Table 2 shows the relevant sections of the policies and legislations addressing the food safety system, implementing authorities and roles and responsibilities of the top management responsible for enacting these legislations.

Table 2: Food safety legislations and regulations in ASF and FV value chains

Law, policy or regulation	Relevant section	Powers of the minister/top management	Status of the document	Remarks	Implementing institution
South Sudan National Livestock Development Policy, Juba, South Sudan, March 2019[8]	**Objectives** 1. To protect livelihoods and human and environmental health by improving veterinary public health and food safety capacity. 2. To ensure food safety standards, competitive international livestock trade, secure livestock mobility and reduced cattle rustling. **Policy area**: Veterinary public health and food safety involve food inspection and prevention and control of zoonoses. Zoonoses outbreaks reduce livestock production, threaten human health and disrupt domestic and international trade. Presently, coordination and capacity to detect, report and respond to zoonoses in South Sudan is weak.	The minister shall commit to take all necessary measures to effectively implement this policy and, in particular, to precisely define the plan of action, institutional structure, financing system and monitoring and evaluation mechanism.	Final draft	ASF	Ministry of Livestock and Fisheries
South Sudan Fisheries Policy, 2012–2016[9]	**Goal**: An effective fish quality control and assurance system that meets international standards and raises the value of the products of fisheries and aquaculture. **Objective**: To ensure the safety of fisheries products **Strategies** 1. Establish a competent authority with the appropriate body (South Sudan Standards Authority) responsible for fish quality control, certification (particularly of exports) and inspection of landing sites and premises. 2. Introduce a local system of inspection and control to reduce negative effects of poor-quality fish products on the consumer. 3. Develop a system to control imports of fish that have not been produced in accordance with international standards and norms. 4. Collaborate with the Ministry of Roads and Bridges and the Ministry of Transport to improve road, air and water communication to fishery-	The draft act makes the minister responsible for preventing pollution of fisheries water bodies.		ASF	

[8] South Sudan National Livestock Development Policy, Juba, South Sudan, March 2019
[9] Fisheries Policy for South Sudan 2012–2016

Law, policy or regulation	Relevant section	Powers of the minister/top management	Status of the document	Remarks	Implementing institution
	dependent areas to improve transport of fresh and processed fish.				
Laws of South Sudan. Meat and Slaughterhouse Inspection Board Bill, 2013[10]	Slaughterhouse design and construction, slaughter hygiene and inspection	Where any slaughterhouse has been ordered to be closed by the Minister in accordance with the provisions of this Bill, any licence issued in respect thereto shall cease to have effect.	Final draft	ASF	Ministry of Livestock and Fisheries
Laws of South Sudan. National Bureau of Standards Act, 2012[11]	**Functions**: 1. To enforce standards in the protection of public health and safety and the environment against harmful ingredients, dangerous products, counterfeits, sub-standard products and materials, and poor performance. 2. To carry out market surveillance to rid the market of dangerous products, counterfeits and sub-standard goods.	The Minister may, on the recommendation of the Bureau of Standards Council, make regulations for carrying out the purposes and provisions of this Act and for prescribing any matter which may be prescribed under this Act.	Working draft	ASF and FV	South Sudan National Bureau of Standards
South Sudan National Quality Policy, 2016[12]	**Rationale:** To facilitate production and trade, enhance export, accelerate economic development and protect the environment, health and safety of consumers and improve the quality of imports. **Governance:** Establishment of a National Quality Council and Sanitary and Phytosanitary (SPS) Committee. The National Quality Council shall set up a National Technical Barriers to Trade Committee and SPS Committee in line with international best practice and African Union recommendations that will address the integration of SPS controls concerning food safety. **Adoption of technical regulations:** Will play a key role with respect to health, safety and environmental protection. **Controls as part of the national quality infrastructure:**	The Minister responsible for the National Quality Policy defines the mandate of the National Quality Council (typically the Minister of Trade and Industry)	Final draft	ASF and FV	Ministry of Trade, Industry and East African Affairs South Sudan National Bureau of Standards

[10] Laws of South Sudan. Meat and Slaughterhouse Inspection Board Bill, 2013
[11] Laws of South Sudan. National Bureau of Standards Act, 2012
[12] South Sudan National Quality Policy (2016)

Law, policy or regulation	Relevant section	Powers of the minister/top management	Status of the document	Remarks	Implementing institution
	An effective product safety framework goes hand-in-hand with efficient control structures. Administrative structures with clearly defined lines of accountability should carry out the control activities.				
National Bureau of Standards Regulation, 2017[13]	Development, adoption and review of technical regulations and SPS measures: Measures taken for the control of products and product categories shall be determined on the basis of scientific proof of their necessity for the safety and well-being of persons and animals, public health, environmental protection, fairness in trade, consumer protection and general security. Declaration of technical regulations and SPS measures.	The Executive Director may declare technical regulations and SPS measures at the recommendation of technical committees of the bureau or national committees established by the government to regulate product quality and safety.	Working document	ASF and FV	South Sudan National Bureau of Standards
South Sudan National Bureau of Standards Food Safety Act, 2019 [14]	Almost all sections of the bill	The Minister, acting in accordance with the advice of the Cabinet, may make any regulations necessary to give effect to this Act.	Proposed draft	ASF and FV	South Sudan National Bureau of Standards
Import and Export Guidelines for Goods Including Processed Foods and Food Products, March 2018[15]	**Compliance with food and agricultural standards:** The pre-import inspection, testing and certification of goods program was designed to help protect consumers by preventing the importation of unsafe food into the country. **Compliance with health and safety standards:** Trading in products that can have an impact on consumer health and safety requires compliance with relevant standards. Such products include food, drugs and chemical substances.	The Minister makes regulations regarding import or export of food, drugs, chemical substances and cosmetics. Products suspected of being contaminated are seized and samples sent to the National Public Health Laboratory Services or the Government Chemist for analysis. The results determine whether to release the consignment for sale, return it to the country of origin or destroy it. Quality Assurance Technic	Working document	ASF and FV	South Sudan National Bureau of Standards Ministry of Health

[13] National Bureau of Standards Regulation (2017)
[14] South Sudan National Bureau of Standards Draft Food Safety Act, 2019
[15] Import and Export Guidelines for Goods Including Processed Foods and Food Products, March 2018

Law, policy or regulation	Relevant section	Powers of the minister/top management	Status of the document	Remarks	Implementing institution
		is authorized to issue certificates of conformity for regulated goods subject to the SSNBS Pre-Export Verification of Conformity program.			
Community Health System in South Sudan: 'The Boma Health Initiative', September 2015[16]	**Goal and objectives**: To conduct home improvement campaigns to promote sanitation and hygiene and carry out water and sanitation interventions	Not relevant	Third draft	ASF and FV	Ministry of Health
Water, Sanitation and Hygiene Sector Strategic Framework[17]	**Sanitation and hygiene sub-sector strategy**: The sanitation and hygiene strategic approach is to provide a strong rationale for investment, define minimum standards, prioritize technical options and propose methods to guide accelerated improvement in basic sanitation and hygiene services for all people. More focus is given on sanitation and hygiene by addressing the sub-sector independent of water supply.	Not relevant	Working document	ASF and FV	Ministry of Water Resources and Irrigation

Note: Unless specifically indicated in the policy documents of these institutions or in a food law as to which categories of food these institutions are mandated to inspect, with the unavailability of food law and strong policies on issues of food safety, such discrepancies will always occur and may result in conflicts.

[16] The Community Health System in South Sudan: 'The Boma Health Initiative', September 2015
[17] Water, Sanitation and Hygiene Sector Strategic Framework

3.2.3 Regulation and control: Inspection

It is crucial that all the steps in the food value chain are regulated and inspected to ensure the safety of raw produce from harvesting to processing. Having clear policies, strategies and standard operating procedures in the food chain optimizes safe production of food commodities and reduces the burden of foodborne diseases. This entails safety and quality checks through inspections and monitoring of all processes for regulation and control to minimize unwanted contaminants in the food matrix. In South Sudan, these processes are done in accordance with the policies and legislations shown in Table 2. Although there is no unified food safety policy, legislation or food law, various institutional documents exist to show that there is implementation of food safety in the country. The challenge is that these documents have not been updated to reflect recent developments. The fragmentation in food safety systems means that each institution performs its own inspection services based on individual policies, resulting in duplication of services and lack of synergy. This overlap in food safety implementation is reflected in Tables 3 and 4.

Most of the inspection activities can be described as informal because most of the products or processes escape the regular food safety inspection program. The overlapping mandates often occur between the SSNBS and the line ministries including DFCA, an agency with a similar mandate. Some activities along the value chain are small scale and processing of food products for export is not prevalent. Fruit juices are processed for the local market. It is important that as the country lays down the foundation for manufacturing, it develops systems to support a robust food and quality control. Table 3 describes different actors in each step (ASF), categorized as either formal (e.g. undergo regular food safety inspection) and informal sectors (e.g. escape regular food safety inspection).

Table 3: Proportion of actors in each step of the ASF value chain

Product/process inspection	Informal	Formal	Inspection	Institution	Overlaps
Smallholder farmers	✔		Product	Ministry of Livestock and Fisheries	No
Commercial farms		✔	Product	Ministry of Livestock and Fisheries	No
Milk and egg collection sites	✔		Product Process	Ministry of Livestock and Fisheries SSNBS	Yes
Informal slaughter sites	✔		Product Process	Ministry of Livestock and Fisheries SSNBS	Yes
Abattoirs, landing sites	✔	✔	Product Process	Ministry of Livestock and Fisheries SSNBS	Yes
Exporters of processed ASF	✔	✔	Product Process	Ministry of Livestock and Fisheries SSNBS	Yes
Transporters of unprocessed ASF	✔	✔	Product Process	Ministry of Livestock and Fisheries SSNBS	Yes
Transporters of processed ASF	✔		Product Process	Ministry of Livestock and Fisheries SSNBS	Yes
Food processing sites	✔		Product Process	Ministry of Livestock and Fisheries SSNBS	Yes
Markets	✔	✔	Product Process	Ministry of Livestock and Fisheries SSNBS Juba City Council	Yes
Groceries and shops	✔		Product Process	SSNBS Juba City Council	Yes
Eating places	✔	✔	Product Process	Juba City Council	No
Street food vendors	✔		Product Process	Juba City Council	No
Consumers	✔				

Table 4: Proportion of actors at each step of the FV value chain

Product/process inspection	Informal	Formal	Inspection	Institution	Overlaps
Smallholder farmers	✔		Product	Ministry of Agriculture and Food Security	No
Commercial farms		✔	Product	Ministry of Agriculture and Food Security	No
Harvesting	✔		Product	Ministry of Agriculture and Food Security	No
Packaging and cold storage		✔	Product Process	SSNBS	No
Processing companies (dried, frozen, juices and pulp)		✔	Product Process	SSNBS	No
Transport for export, supermarkets and local retailers		✔	Product Process	SSNBS	No
Transporters of unprocessed ASF	✔		Product Process	SSNBS	Yes
Transporters of processed ASF	✔		Product Process	SSNBS DFCA, Juba City Council	Yes
Display: markets, shops kiosks	✔		Product Process	SSNBS DFCA, Juba City Council	Yes
Purchases	✔		Product Process	SSNBS DFCA, Juba City Council	Yes
Consumer	✔				

Duplication of inspection mandates is evident between the Ministry of Livestock and Fisheries and SSNBS in regard to product and process inspection in ASF value chains and between the SSNBS, Juba City Council and DFCA in FV value chains. Under Section 17 of the Regulations (National Bureau of Standards), the Chief Executive Officer of the bureau can impose a temporary ban; similar bans can be executed under Section 8 (1) (j) and (k) of the Draft Food Safety Act (2019) Part III. Although inspections are carried out by the institutions vested with the powers to do so (Table 2), there are no data on the number of premises inspected and proportions of inspected premises that fail to comply.

There are an estimated 1500 national government food inspectors and 500 seconded to the local government. All inspectors are government employees. This workforce is not adequate for the number of existing businesses that require inspection services. The entry-level requirement for food inspectors is a graduate degree (e.g. in veterinary medicine). However, diploma graduates and secondary school leavers with relevant on-the-job training and experience have been considered. The same criterion is used for both ASF and FV. Capacity building programs exist within the institutions implementing food safety mandate to improve the efficiency of their staff. Inspectors are authorized by law (technical regulatory powers) to close down plants or businesses dealing with production or sale of food products or commodities if deemed to be non-compliant with food safety standards.

Depending on the deviation, the inspectors can fine, seize food items or dispose of unfit foods. In accordance with the National Bureau of Standards Regulation 2017 Section 25 under the title Destruction, a committee for the disposal of the food items is formed (includes inspectors from the agencies that carried out the inspection and representatives from the police city council e.g. Juba City Council and National Security) to ensure that the food is disposed of and burnt so that nobody will go and retrieve it.

Although manufacturing and processing are emerging sectors and the country imports food, it exports honey, gum arabic, sesame and groundnuts. The current inspection activities focus only on minor points within the food supply chain. Inspections at farm, retail, market and export levels are infrequent and rather informal. Since the country imports a lot of food, more effort in inspection is directed at border entry points. The exception to this is ASF where a number of nodes are covered. The country is a member of the EAC and is mandated by the protocol to use the EAC harmonized standards. Table 5 shows the perception of the experts on the proportions of foods inspected.

Table 5: Probability of ASF and FV inspected

Foods inspected	Probability of inspection	
	ASF	FV
Street foods	0	0
Foods sold in small rural villages	0	0
Foods sold in pastoralist areas	0	0
Foods sold in open markets	1 in 1000	1 in 1000
Foods hawked door to door	0	1 in 1000
Foods at celebrations, feasts and events (by definition, these cannot be inspected regularly)	0	0
Foods in remote areas	0	0
Animals killed for home consumption	0	0
Foods in institutions (hospitals, schools, canteens)	1 in 100	1 in 100
Foods sold in supermarkets	1 in 1	1 in 1
Foods sold in eating places	1 in 100	1 in 100
i) established hotels	0	0
ii) kiosks and iii) streets	0	0
Foods exported	1 in 100	1 in 100

1 in 1: Every item of food has almost certainly been individually inspected
1 in 100: Of every 100 items sold, around one will have undergone individual visual inspection
1 in 1000: Of every 1000 items sold, around one will have undergone individual visual inspection
0: It is very unlikely that an item of food has been inspected

3.2.4 Regulation and control: Private sector

Tables 6 and 7 indicate the private sector firms that use standards in ASF and FV value chains.

Table 6: Private sector firms using standards in ASF chains

Sector	Standards	Pre-requisites	HACCP approach	HACCP certification	ISO QMS standards	ISO food safety
Smallholder farms	GAP	SSNBS Pest and vermin control	No	No	No	No
Commercial farms	GAP	SSNBS Water and waste disposal Pest and vermin control	No	No	No	No Draft SSNBS
Food collection units, bulking, packing and storage	GHP	SSNBS Personal hygiene Water and waste disposal Pest and vermin control	No	No	No	No SSNBS
Slaughterhouses, fish landing sites	GHP	Personal hygiene Water and waste disposal	No	No	No	No
Food transporters	GHP	Personal hygiene Pest and vermin control	No	No	No	No
Food processing sites	GMP GHP	Personal hygiene Water and waste disposal Pest and vermin control	No	No	No	No
Local markets	GHP	Personal hygiene Water and waste disposal	No	No	No	No
Shops	GHP	Water and waste disposal Pest and vermin control	No	No	No	No
Eating places	GHP	Personal hygiene Water and waste disposal Pest and vermin control	No	No	No	No
Other	GHP	Personal hygiene Water and waste disposal Pest and vermin control	No	No	No	No

GHP: good hygienic practice; GAP: good agricultural practice; GMP: good manufacturing practice

Table 7: Private sector firms using standards in FV value chains

Sector	Individual standards	Pre-requisites	HACCP approach	HACCP certification	ISO QMS standards	ISO food safety
Smallholder farms	GAP	Pest and vermin control	No	No	No	No
Commercial farms	GAP	Water and waste disposal Pest and vermin control	No	No	No	No
Food collection units, bulking, packing and storage	GHP	Personal hygiene Water and waste disposal Pest and vermin control	No	No	No	No
Harvest, storage, processing (juices, pulps, dried, frozen), fish landing sites	GHP	Personal hygiene Water and waste disposal	No	No	No	No
Food transporters	GHP	Personal hygiene Pest and vermin control	No	No	No	No
Food processing sites	GMP GHP	Personal hygiene Water and waste disposal Pest and vermin control	No	No	No	No
Local markets	GHP	Personal hygiene Water and waste disposal	No	No	No	No
Shops	GHP	Water and waste disposal Pest and vermin control	No	No	No	No
Eating places	GHP	Personal hygiene Water and waste disposal	No	No	No	No
Other	GHP	Personal hygiene Water and waste disposal Pest and vermin control	No	No	No	No

GHP: good hygienic practice; GAP: good agricultural practice; GMP: good manufacturing practice

3.2.5 Regulation and control: Civil society

The South Sudan Consumer Protection Association is one of the civil society organizations operating in the country. However, information on its membership and source of funding is unknown.

3.3 Products

The products of concern are ASF and FV. Data sources include FAOSTAT database and local sources. Consumption of ASF is covered in Table 8. Important and major sources of animal protein specific to South Sudan include bush meat and animal blood. Bush meat is more frequently consumed in rural than in urban households. Bush meat is considered a delicacy based on cultural practices and fetches higher prices in the underground markets. Bush meat is always hunted during the dry seasons and preserved by smoking, salting and drying for the rainy seasons. Consumption of raw or cooked blood is practised in some rural communities in Eastern Equatoria and is supported by cultural beliefs.

Table 8: Consumption of ASF

ASF	Consumption (tonnes)	Total production (tonnes)	Exports	Imports
Beef	No data	227,739	NA	NA
Goat	No data	47,731	NA	NA
Sheep	No data	128,331	NA	NA
Poultry	No data	20,000	NA	NA
Camel	-	-	NA	NA
Pork	-	-	NA	NA
Eggs	-	-	NA	NA
Milk and milk products	No data	2,658,626	NA	NA
Milk: whole fresh from goat	No data	459,343	NA	NA
Milk: whole fresh from sheep	No data	145,275	NA	NA
Fish (freshwater)	No data	30,980	NA	NA

Source: FAOSTAT (2018)

Consumption of FV is covered in Table 9. Niche agro-produce fruits specific for the South Sudanese population include guavas, papaya, gishta (sugar apple), kurnyuk (*Vitex doniana*) lalub (*Balanites aegyptiaca*), ardeib (*Tamarindus indica*), tomur hindi (Madras thorn/Manila tamarind), dates, lemon gaba and lemon. Niche agro-produce vegetables include khudra (Jew's mallow), gwedegwede (amaranth), pondu (cassava leaf), lulu (*Vitellaria paradoxa*) and ngete (White Beans leaf). Notably, fruits such as guavas, gishta, papaya, tamarind and tomur hindi are grown in abundance especially in Equatoria region and part of Bahr el Ghazal region.

Table 9: Consumption of FV

Fruit/vegetable	Consumption (tonnes)	Total production (tonnes)	Exports	Imports
Mangoes	No data	Data not available	NA	NA
Pineapples	No data	4,222	NA	
Oranges	No data	Data not available	NA	
Bananas	No data	Data not available	NA	
French beans (green)	No data	1,015	NA	
Carrots	No data	Data not available	NA	
Tomatoes	No data	Data not available	NA	
Kale	No data	Not listed	NA	
Spinach	No data	Data not available	NA	NA
Cauliflower	No data	Data not available	NA	NA
Onions	No data	Data not available	NA	
Managu	No data	Not listed	NA	
Terere	No data	Not listed	NA	

Source: FAOSTAT (2018)

As at 2018, the rural population comprised 80.4% and the urban population 19.4%. The rural population depends on subsistence farming for their livelihoods. This is the situation for production of ASF and FV. There are no data on purchases of ASF and FV by rural and urban households. The data in Table 9 are based on the expert opinions of the country team members. In urban areas, milk, meat, eggs and FV are purchased directly from farmers or wet markets. For meat, animals are slaughtered at domestic markets or homes. These products are purchased raw or processed from small shops, kiosks, vegetable stalls and supermarkets.

Livestock population data for South Sudan are unreliable because they are based on Gross Domestic Product (GDP) calculation and the GDP estimate is unreliable. The recent official estimate for South Sudan livestock GDP is US$ 1.7 billion but this estimate includes forestry and fisheries. However, using the Intergovernmental Authority on Development country study method of production, the livestock GDP is estimated to be US$ 3 billion. Prior to the Comprehensive Peace Agreement, South Sudan used to export livestock to Uganda. This was in exception to cross-border trade among South Sudan, Sudan and Ethiopia. During that period, South Sudan was both exporting and importing livestock[18]. Presently, South Sudan depends heavily on imports of some food commodities including animal products such as eggs, processed milk and fish. These food commodities are sold in both formal and informal markets.

Table 10: ASF and sectors

Product	Produced	Processed formal sector	Sold informal sector
Beef	Yes	Yes	Yes, in large quantities
Shoat	Yes	Yes	Yes
Poultry	Yes	Yes	Yes
Pork	In small quantities	No	Yes
Eggs	Yes	Yes	Yes
Milk and milk products	Yes	Yes	Yes, in large quantities

Source: Ministry of Livestock and Fisheries, Government of South Sudan [19]

[19] Ministry of Livestock and Fisheries, Government of South Sudan

FV are mostly imported except for indigenous vegetables like okra, khudra, gwedegwede, lobutere, pondu and fruits like mangoes, lemon, guavas, tamarind, tomur hindi, gishta, dates and lemon gaba. Mangoes, lemons and dates are still imported but not in large quantities.

Table 11: FV and sectors

Fruit/vegetable	Produced	Processed formal sector	Sold informal sector
Mangoes	Yes	Yes	Yes
Pineapples	Yes	Yes	Yes
Oranges	Yes	Yes	Yes
Bananas	Yes	No	Yes
French beans	Yes	Yes	Yes
Carrots	Yes	No	Yes
Tomatoes	Yes, in low quantities	Yes	Yes
Kale	Yes, in low quantities	No	Yes
Spinach	Yes	No	Yes
Cauliflower	Yes	No	Yes
Onions	Yes	No	Yes
Managu	-	-	-
Terere	-	-	-
Saget	-	-	-
African leafy vegetables	Yes, in large quantities	No	Yes

Source: Ministry of Agriculture and Food Security, Government of South Sudan[20]

There is no information available on linkages between formal, informal and export sectors for ASF and FV. The informal sector counterfeits the formal sector by reusing plastic bottles used for water and soft drinks to sell cooking oil and locally made juices and by reusing plastic bags to sell FV. On the other hand, the formal markets copy strategies from informal markets such as selling (food) items, especially those nearing expiry date, in the informal markets at a lower price.

Table 12: ASF and role of actors

Food	Producer	Processor	Retailers	Importers
Beef	Local producers	Havana Juba Centre Jet Supermarket Beijing Supermarket Lilli's Supermarket Phenicia	Havana Juba Centre Jet Supermarket Beijing Supermarket Lilli's Supermarket Phenicia	
Poultry	South Farmers	South Farmers Havana Juba Centre Jet Supermarket Beijing Supermarket Lilli's Supermarket Phenicia	South Farmers Havana Juba Centre Jet Supermarket Beijing Supermarket Lilli's Supermarket Phenicia	South Sudan Farmers Retailers
Pork	Freedom Farms	Freedom Farms	Freedom Farms	
Eggs				Retailers
Milk and milk products	Local producers	NICODO	NICODO	Retailers

[20] Ministry of Agriculture and Food Security, Government of South Sudan

Table 13: FV and role of actors

Food	Producers	Retailers	Importers
Mangoes	Local producers	Local retailers Beijing Supermarket Jet Supermarket Lili's Supermarket Phenicia	
Guava	Local producers	Local retailers Beijing Supermarkets Jet Supermarket Lili's Supermarket Phenicia	
Oranges	Local producers	Local retailers Beijing Supermarket Jet Supermarket Lili's Supermarket Phenicia	Retailers
Bananas	Local producers Green Horizon Global Farms	Local retailers Green Horizon Global	Retailers
Watermelon	Double Harvest Farms Premium Agro-consult	Local retailers Beijing Supermarket Jet Supermarket Lili's Supermarket Phenicia	
Carrots		Beijing Supermarket Jet Supermarket Lili's Supermarket Phenicia	Retailers
Tomatoes	Green Horizon Global Farms Premium Agro-consult Farms Double Harvest Farms	Local retailers Beijing Supermarket Jet Supermarket Lili's Supermarket Phenicia	Retailers
Egg plant	Double Harvest Farm Premium Agro-consult Green Horizon Global	Local retailers Beijing Supermarket Jet Supermarket Lili's Supermarket Phenicia	Retailers
Spinach	Double Harvest Premium Agro-consult	Local retailers	Retailers
Cauliflower		Beijing Supermarket Jet Supermarket Lili's Supermarket Phenicia	Retailers
Onions	Green Horizon Global	Local retailers Beijing Supermarket Jet Supermarket Lili's Supermarket Phenicia	Retailers
Cucumber	Green Horizon Global Double Harvest Premium Agro-consult	Local retailers Beijing Supermarket Jet Supermarket Lili's Supermarket Phenicia	Retailers
Collard greens	Green Horizon Global Premium Agro-consult	Local retailers Beijing Supermarket Jet Supermarket Lili's Supermarket Phenicia	Retailers
Peppers	Double Harvest Premium Agro-consult Green Horizon Global	Local retailers Beijing Supermarket Jet Supermarket Lili's Supermarket Phenicia	Retailers
Okra	Local Producers Double Harvest Farms Green Horizon Global Farms	Local retailers Beijing Supermarket Jet Supermarket Lili's Supermarket Phenicia	
Lettuce	Double Harvest Farms	Local retailers	Retailers
Cabbage	Green Horizon Global Farms	Local retailers	Retailers

Traceability schemes are not available at the moment in South Sudan. This stems from the lack of a regulatory framework. In most cases, ASF like meat must display a stamp from a certified inspector during the day. Almost all (70–80%) cattle carcasses have stamps. Generally, products such as beef, poultry, pigs and milk that are to be sold in formal markets have to be inspected by a certified inspector unless sold informally or slaughtered in private slaughterhouses. There are tests carried out to verify the quality of these products in addition to visual tests. Inspection of FV is normally done by visual tests and therefore, there is no sign that signifies that a particular product has been inspected. In the wet markets, an inspection fee is paid according to the number of carcasses inspected. A premium price is paid for ASF but it is difficult to assess the prices due to lack of reliable data. In addition, consumers are not aware of the safety logo or brand that should appear on inspected products.

In South Sudan, inferior quality products can enter the food chain in large quantities at any point especially during sale at the local markets, supermarkets and shops. The challenge is of lack of chilling facilities for meat, milk and FV and this extends to shops and supermarkets. Slaughterhouses serving the main cities have chilling facilities for meat.

In Juba, traders may take two to three days to sell meat and one to two days to sell milk and milk products. Perishable vegetables like leafy vegetables may take one to two days to sell while other vegetables like okra may be sold over an extended period depending on storage. A well-ventilated store with no pests may serve to extend the shelf-life of FV. The volumes put out for sale depend on the consumption pattern of the products and how long they can be stored.

3.4 Problems

From the available data, *Vibrio cholerae* and non-typhoidal *Salmonella* are the main pathogens responsible for foodborne diseases. At the moment, there are few detection techniques for the foodborne diseases and management of cases depends on severity. Two laboratories are available for isolation and analysis of these foodborne disease hazards.

Pathogenic bacteria of animal origin, pathogenic bacteria of human origin, radioactive contaminants and deliberate poisoning are the most important hazards. There is mixed information on testing of food commodities for mycotoxin with some saying that there is regular testing while others saying there is no testing for chemical contaminants (Table 14).

Table 14: Foodborne hazards in ASF and FV, their public health importance and mode of testing

Hazard	ASF			FV		
	Present	Rank	Mode of testing	Present	Rank	Mode of testing
Adulteration	2	3	Episodic	3	3	Episodic
Pathogenic bacteria of animal origin	1	2	Regular	3	2	Regular
Pathogenic bacteria of human origin	1	2	Regular	1	2	Regular
Foodborne viruses	2	3	Regular	1	3	Regular
Parasites	2	3	Regular	1	3	Regular
Mycotoxins	1	3	Regular	3	3	Regular
Food additives	3	3	Regular	3	3	Regular
Pesticide residues	2	3	Episodic	1	3	Episodic
Heavy metals	2	3	Regular	2	3	Regular
Chemicals	2	3	Episodic	1	3	Episodic
Antibiotic residues	3	3	Not tested	3	3	Not tested
Hormones	3	3	Not tested	3	3	Not tested
Radioactive contaminants	1	2	Not tested	1	2	Not tested
GMOs	2	3	Episodic	2	3	Episodic
Deliberate poisoning	2	2	Episodic	2	2	Episodic

Ranking of public health importance: 1: most important; 2: important; 3: least important
Regular testing: products are tested regularly; Episodic testing: occasional surveys or investigation of problems

Food safety scares documented in the last 10 years were mainly cholera and typhoid fever but since 2016, no other food safety scares have been documented. Between 2017 and 2019, three suspected cases of food poisoning were aired by the local media (Radio Tamazuj [21]and Radio Miraya[22]) and involved children, five of whom died in Torit Town in Eastern Equatoria. In 2019, Eye Radio[23] reported suspected food poisoning in Leer and Naak (this food was donated by the World Food Programme). Food poisoning involving 60 soldiers in Wau and two deaths was reported by Eye Radio in 2017. In these three cases of media reporting, there was no tracing back of the incriminated food and pathogens involved. To date, there is no information or study on the impact of the scares on the economy and no changes have been effected in policies and regulations.

Non-typhoidal salmonellosis was reported among 300 hospitalized people and one person died in Bor Town after consuming food in Jonglei State (2018). Cholera was reported in Mingkaman settlement for internally displaced persons after two out of four samples tested positive for *Vibrio cholerae* (Inaba 2016). With support from the World Health Organization, the Ministry of Health has a cholera surveillance system in the country and is able to trace cholera outbreaks. South Sudan has experienced intermittent cholera epidemics and hotspots have been mapped to enable contingency plans.

There is normally a change of behaviour of consumers with regard to preventive measures (hygienic practices of eating of warm foods, which has become very common). Some people, especially the working class, avoid eating food from restaurants and other outlets while others only avoid eating vegetables and fruit salads in the eateries. The impact of foodborne disease on the local economy is seen in a reduction of the sale of some FV because of public perception that eateries and fruit salads are the vehicles of transmission of the hazard.

3.5 Laboratories

The Public Health Laboratory is the only laboratory that has the capacity (infrastructure, personnel and equipment) to analyse food samples during outbreaks of foodborne disease. Other laboratories include those at SSNBS and DFCA. There are four government-owned food safety laboratories and no private food laboratories; these laboratories above do not have analytical capacity to detect all the food safety hazards indicated in Table 15. Some of the tests that these laboratories can perform are bacterial, viral, parasites and chemical hazards. The challenge is that there are no data on the origin and number of samples of ASF and FV tested for specific pathogens and the number of the positive cases in the past five years.

Highly important foodborne hazards in South Sudan include *Brucella*,[24] non-typhoidal *Salmonella* sp., *Vibrio* sp., hepatitis A, *Mycobacterium bovis, M. tuberculosis*, *Giardia*, *Entamoeba histolytica* and aflatoxin (Table 15). Of medium importance are *Listeria*, *Ascaris* sp., pesticide residues and antimicrobial residues. The less important foodborne hazards include *Cryptosporidium parvum*, *Toxoplasma gondii* and *Taenia solium*. Some foodborne hazards such as *Campylobacter*, enterotoxigenic *E. coli*, *Shigella*, *Yersinia enterocolitica*, norovirus, *Trichinella spiralis* and genetically modified organisms (GMOs) are not categorised because there is no information about them.

[21] Radio Tamazuj, 18 July 2019
[22] Mach Samuel Adut, 20 February 2018
[23] Ijoo Bosco. Published 18 July 2019, Eye Radio
[24] Madut, N.A., Muleme, J., Kankya, C., Nasinyama, G.W., Muma, J.B., Godfroid, J., Jubara, A.S. and Muwonge, A. 2019. The epidemiology of zoonotic brucellosis in Bahr el Ghazal region of South Sudan. *Frontiers in Public Health* 7: 156. https://doi.org/10.3389/fpubh.2019.00156

Table 15: Important foodborne hazards in ASF and FV

Hazard	Importance	ASF or FV	Evidence
Campylobacter	Unknown		
Enteropathogenic and enterotoxigenic *E. coli*	Unknown		2018, Bor Town 433 positive cases out of 1000 suspected Outbreak food: beef, vegetables and tap water http://www.southsudanmedicaljournal.com/archive/november-2015/epidemiological-and-antibiotic-susceptibility-profiles-of-infectious-bacterial-diarrhoea-in-juba-south-sudan.html
Cryptosporidium parvum	Low	ASF	
Shigella	Unknown		Bliss, J., Bouhenia, M., Hale, P. et al. 2018. High prevalence of *Shigella* or enteroinvasive *Escherichia coli* carriage among residents of an internally displaced persons camp in South Sudan. *American Journal of Tropical Medical Hygiene* 98(2): 595–597. https://doi.org/10.4269/ajtmh.17-0339
Listeria	Medium	ASF	
Brucella	High	ASF	2012, Terekeka Town 58 positive cases out of 16 suspected. Outbreak food: raw and fermented milk December 2015 to May 2016, Wau Town 282 positive cases out of 1664 suspected Outbreak food: Yoghurt 2016, Wau Town 75 butchers tested positive out of 234 patients Outbreak food: Meat and milk
Non-typhoidal *Salmonella* spp.	High	ASF	2018, Bor Town 300 people hospitalized, 1 death Outbreak from contaminated food
Vibrio	High	FV	June 2016, last outbreak, all part of South Sudan including Juba 20,000 suspected cases, 436 deaths; outbreak mainly due to unclean water and contaminated food
Toxoplasma gondii	Low	ASF	
*Yersinia enterocolitica**	Unknown		
Norovirus	Unknown		
Hepatitis A	High	FV	
Hepatitis E			2012, Maban Town 5,080 acute jaundice syndrome. Possible cause of outbreak: unclean water and lack of hygiene
Mycobacterium bovis and M. tuberculosis	High	ASF	January and February 2016, Wau Town 207 positive cases out of 1035 suspected Outbreak food: milk
Giardia	High	FV	Bayoumi, M., Nykwac, O., Kardaman, M., Ullberg, M., Alshammari, E.M. et al. 2016. Intestinal parasitic infections in school students in Malakal City, Upper Nile State, South Sudan. *SOJ Microbiology & Infectious Diseases* 4(1): 1–5. Magambo, J.K., Zeyhle, E. and Wachira, TM. 1998. Prevalence of intestinal parasites among children in southern Sudan. *East African Medical* Journal 75(5):288–290.
Ascaris spp.	Medium		
Taenia solium	Low	ASF	
Trichinella spiralis	Unknown		
Entamoeba histolytica	High	FV	Magambo JK, Zeyhle E, Wachira TM. Prevalence of intestinal parasites among children in southern Sudan. *East Afr Med J*. 1998;75(5):288-290.
Pesticide residues	Medium	FV, ASF	Kuorwel, K.K., Lumori, C.S. and Andrew, A.K. 2018. Review of South Sudan's food safety status in relation to chemical contaminants. *MOJ Food Processing & Technology* 6(1): 113–120. https://doi.org/10.15406/mojfpt.2018.06.00153
Antimicrobial residues	Medium	ASF	
GMOs	Unknown		
Aflatoxin	High	FV, ASF	

No epidemiological surveys have been carried out on the presence, prevalence, incidence or impact of food safety problems. However, there were studies by researchers from University of Juba and Bahr el Ghazal on brucellosis and salmonellosis, respectively. The country employs the integrated disease surveillance and response framework to report on unusual cases of illness or disease that helps health officials in the capital to track and investigate the cases.

3.6 Priorities

Setting clear priorities for the food safety system in South Sudan is highly challenging owing to a number of factors. All institutions involved in food safety work individually and there are no established unified coordinating mechanisms to reduce duplication of activities. This weak collaboration among the stakeholders has resulted in fragmentation and confusion in the implementation of food safety mandates. The food safety priorities in South Sudan differ between stakeholders since the country does not have a unified body to handle food safety issues.

There are many foodborne illnesses in South Sudan caused by various biological and chemical hazards. The most common foodborne illnesses include cholera, non-typhoidal salmonellosis, tuberculosis, diarrhoeal dysentery and brucellosis. The underlying causes of most of these diseases are related to poor hygiene and sanitation and consumption of contaminated foods.

The absence of reliable data on the burden of foodborne diseases impedes understanding about its public health importance and may prevent the development of risk-based solutions to its management. To achieve an overarching coordination mechanism, there is a need for greater political will from the ruling class and prioritization of food safety. A sound scientific risk assessment as an essential part of food safety risk management is relatively weak. Because of this, the South Sudan multidisciplinary team that participated in the food safety workshop in Addis Ababa in August 2019 used information available in the public domain to suggest to the different stakeholders the food safety priorities the country can concentrate on.

As a result, the team ranked and prioritized the top five foodborne illnesses based on public health importance, markets and food security. A qualitative ranking and prioritization, shown in Table 16, was used to evaluate each of the criteria. The overall ranking was based on the combination of the three criteria and cholera emerged on top of the list followed by typhoid. The last in the ranking was diarrhoeal dysentery while both tuberculosis and brucellosis ranked third. More details of the ranking and prioritization are in shown in Annex 2.

Table 16: Prioritization of top five foodborne diseases in South Sudan

Foodborne illness	Public health importance	Impact on consumers	Impact on producers	Impact on export	Lack of knowledge	Concern of stakeholders	Other initiatives
Cholera	1	1	4	5	2	1	4
Typhoid	1	1	4	5	3	3	4
Tuberculosis	1	3	3	5	4	4	4
Diarrhoeal dysentery	2	3	3	5	4	4	5
Brucellosis	2	2	3	5	4	3	4

4. Conclusions

Today, foodborne illnesses are among the major health problems and can lead to fatalities or the development of other diseases. The surveillance infrastructure for foodborne diseases of both microbiological and chemical aetiology is non-existent in the Republic of South Sudan. With the exception of cholera, there are no data available for foodborne diseases reported in the country. The absence of reliable data on the burden of foodborne disease impedes understanding about its public health importance and may prevent the development of risk-based solutions to its management.

Presently, activities for food safety and control in South Sudan are uncoordinated and scattered among various ministries and institutions. This review has shown a series of weaknesses that include the absence of involvement or weak engagement of stakeholders across the spectrum of emergency food safety management, including food safety risks, strengthening capacities, engaging and acting in prevention and preparedness of food emergencies. Food control laboratories in South Sudan are generally weak and do not have the capacity to test for chemical contaminants and naturally occurring toxins. Furthermore, the ability of South Sudan to monitor foodborne diseases and implement food safety measures is inadequate. Annex 3 shows some of the inadequacies and proposed strategies in terms of food safety management in the Republic of South Sudan.

Annex 1: Risk assessment approaches

Name of agency	'Informal' risk assessment	Qualitative codex	Quantitative codex	Qualitative OIE	Quantitative OIE	Qualitative IPPC	Quantitative IPPC

Annex 2: Food safety issues for decision-making

Foodborne illness	Public health importance	Impact on consumers	Impact on producers	Impact on export	Lack of knowledge	Concern of stakeholders	Other initiatives
Cholera	1	1	4	5	2	1	4
Typhoid	1	1	4	5	3	3	4
Tuberculosis	1	3	3	5	4	4	4
Diarrhoeal dysentery	2	3	3	5	4	4	5
Brucellosis	2	2	3	5	4	3	4

* 1= highest risk/impact; 5= lowest risk/impact

Public health impact

Foodborne illness	Immediate illness	Long-term	Deaths	Rank
Cholera	1	4	1	6
Typhoid	1	4	3	7
Tuberculosis	1	4	4	9
Diarrhoeal dysentery	2	5	4	11
Brucellosis	2	4	3	9

* 1= highest risk/impact; 5= lowest risk/impact

Market-level impact

Foodborne illness	Export	Domestic	Rank
Cholera	5	2	7
Typhoid	5	3	7
Tuberculosis	5	4	9
Diarrhoeal dysentery	5	4	9
Brucellosis	5	4	9

* 1= highest risk/impact; 5= lowest risk/impact

Food security risk

Foodborne illness	Nutritional status	Food availability	Food accessibility	Rank
Cholera	1	4	3	8
Typhoid	1	4	4	9
Tuberculosis	3	3	3	9
Diarrhoeal dysentery	3	3	3	9
Brucellosis	2	3	4	9

* 1= highest risk/impact; 5= lowest risk/impact

Food safety issues for decision-making

Foodborne illness	Single criterion ranking			Multi-factor prioritization
	Public health	Market-level	Food security	
Cholera	6	7	8	21 (1)
Typhoid	7	7	9	23(2)
Tuberculosis	9	9	9	27(3)
Diarrhoeal dysentery	11	9	9	29(4)
Brucellosis	9	9	9	27(3)

* 1= highest risk/impact; 5= lowest risk/impact

Annex 3: Food safety challenges and proposed way forward

Food safety challenge	Proposed way forward/strategies
No clear approach within the food chain from farm to table to manage food safety (fragmented approach in managing food safety)	Setting up of a proper functional coordination mechanism involving SSNBS, DFCA, MoH, MAFS, MLF, MTI and consumer organization Establishment food safety coordinating committee
Legislations dealing with food safety are scattered among various ministries and have not been unified	Development of a coherent national food safety strategy encompassing the entire food chain of South Sudan
Lack of communication and coordination among ministries, local governments, academia, industries and consumer organizations	Building capacity of training institutions in the context of food safety
Insufficient exchange of information, training and advice to stakeholders and consumers	Development of a risk assessment framework and use of risk assessment in food safety management Committee to develop a communication strategy and training on food safety and food control matters
No risk assessment framework	Capacity building in risk assessment through training, improving analytical infrastructure (laboratories) and systematic data collection and sharing amongst stakeholders. Recommend MoH to become the lead agency in food safety matters.
No involvement or inadequate involvement of academia, industry and research institutions in food control decision-making	Setting up a coordination mechanism involving research and academic institutions
Inadequate inspection framework	Establish a national policy on food traceability and recall system to enable quick and effective recall communication