



Policy Brief - SPS Landscape/ Regulatory and Economic Impact of Key Value Chains in Selected Sub-Saharan African Countries

DECEMBER 2022

Authors: I. Gokah¹, M. Gichuri², M. Ndemera.³

This policy brief is based on two assessments: (i) Assessing the Food Safety and Nutrition Landscape and Key Value Chains in Select Countries in Sub-Saharan Africa; (ii) Economic Impact of Food Safety Measures on Regional Food Trade: A case study of AGRA Focus countries. These were done under the Food Trade Coalition for Africa, through AGRA's Regional Food Trade & Resilience Unit with support from the United States Agency for International Development (USAID).

The opinions expressed in this report are those of the authors and do not reflect the official policy or position of FTCA or AGRA, its employees, partners or its affiliates in any way. The mention of specific companies, manufacturers or their products, whether or not these have been patented, does not imply endorsement or recommendation or approval by FTCA or AGRA, its employees, partners or their affiliates in preference to others of a similar nature that are not mentioned. The descriptions, charts and maps used do not imply the expression of any opinion whatsoever on the part of FTCA or AGRA concerning the development, legal or constitutional status of any country.

¹ Regional Food Trade Programme Officer, Regional Food Trade and Resilience Unit, AGRA

² Coordinator, Food Trade Coalition for Africa, Regional Food Trade and Resilience Unit, AGRA

³ Independent Consultant



Key Messages

Food safety regulatory landscape

- The food safety regulatory landscape in African countries is fragmented, with food safety regulations falling under the responsibility of different institutions, agencies, and departments that carry out mandates independently with minimal or no linkages, and with some evidence of overlap.
- The lack of harmonization in food safety legislation and regulations also poses a huge challenge in addressing issues to deal with non-conformity to prescribed standards and regulations for African countries.
- In most of the selected countries, Sanitary and Phytosanitary (SPS) Committees are not functional, and African countries are also not in a position to generate scientific evidence to support their SPS measures and strategies.
- SPS constraints faced by the reviewed countries range from unaccredited labs to lack of resources to carry out risk assessments and risk analyses
- Cognizant of the African Continental Free Trade Area (AfCFTA) agreement and the African Union (AU) food safety policy framework, which seeks to strongly and consistently align African SPS systems with international science-based standards, there is need to do more towards the development of supporting mechanisms for the implementation of Annex 7 of the AfCFTA agreement.
- The key value chains identified as susceptible to SPS issues and are important to increasing interregional trade due to high production, export potential, and national prioritization in the various national agricultural policies of the reviewed countries are maize, sugar cane, rice, livestock, bananas, fresh vegetables, palm oil, coffee, black tea, fish/sea food, cashew nuts, groundnuts, soya beans, potatoes, wheat, cocoa, and sesame seed.

Economic costs of food safety measures

- There is inadequate data to explicitly quantify the economic costs associated

with food safety, and countries need to invest in data generation in order to fill this crucial data gap.

- Priority value chains from selected countries affected by SPS measures in the five-year period between 2016 and 2022 were found to be maize and livestock. The SPS issues of concern were aflatoxins and genetically modified content in maize, foot and mouth disease in cattle, and avian flu in poultry.
- Exporting countries affected by SPS measures were Uganda, United Republic of Tanzania, South Africa, and Zimbabwe while the affected importing countries were Kenya, Mozambique, Rwanda and United Republic of Tanzania. The effect of decreased exports and induced commodity shortages in the importing countries had the negative impact of decreased revenues for producers, and increased retail prices, to consumers respectively. When combined, i.e., for the specific issues and value chains analysed, SPS measures cost the affected countries in excess of US\$1.2 billion in the five years between 2016 and 2021.
- The combined economic costs associated with SPS measures in the selected countries were US\$235.9 million (aflatoxin in maize), US\$ 105.52 million (Genetically modified content), and US\$937.4 million (Avian flu).
- Blanket bans on non-compliant commodities resulted in a decrease in formal imports, yet informal imports increased significantly, and in so doing negating the intended purpose of protecting public health. This was the case when Kenya banned aflatoxin contaminated maize from Uganda and the United Republic of Tanzania from being imported into the country.
- Domestic food prices were negatively impacted by commodity bans across all the key value chains.
- Mitigation costs for aflatoxin contamination in maize, foot and mouth disease in cattle and avian flu in poultry were found to be high, further pushing up domestic commodity prices.

Introduction

Africa has continued to play a minimal role in global agricultural trade. Despite the strengthening of the continent's comparative advantage in agricultural products in recent years, non-tariff barriers (NTBs) and non-tariff measures (NTMs) including sanitary and phytosanitary (SPS) requirements and technical barriers to trade (TBT) present the biggest impediment to Africa's trade performance. With the operationalization of the AfCFTA agreement, numerous opportunities to increasing regional trade are presented for Member States. However, food safety remains an important aspect of regional and intercontinental trade, and African countries still face challenges in aligning their regulations to international standards.

Currently, regulatory measures on the continent are mainly export oriented and are not necessarily implemented to mitigate food safety risks associated with domestic food supply chains, therefore they are not designed to protect domestic consumers including the poorest and the most vulnerable groups. Most African countries are struggling to define a specific appropriate level of protection (ALOP) for their citizens on which to base national policies, standards and regulations, due to lack of technical and scientific capacity. Food safety regulation also does not have a positive impact on regional trade due to minimal enforcement at domestic level. Subsequently, SPS measures remain a major impediment to trade for African countries, who face challenges including limited technical support to drive harmonization and convergence of sanitary and phytosanitary (SPS) standards based on science, and aligned with those of International Standard Setting Bodies (ISSB), namely Codex Alimentarius, World Organisation for Animal Health (OIE) and International Plant Protection Convention (IPPC). The aim of this policy brief is to outline the food safety landscape in selected sub-Saharan African countries⁴, to identify key value chains susceptible to SPS constraints, and to identify opportunities to increasing regional food trade.

The food safety regulatory landscape was assessed through a comprehensive desk review of multilateral, continental, and regional agreements and decisions as well as national legislation and policies. Stakeholder consultations and interviews with relevant government departments, ministries, and regulatory authorities, was further used to complement the desk reviews. The economic cost assessment used secondary data and focused on maize and livestock, as they are the largely traded commodities with historical SPS issues particularly between the selected focus countries. This study could not cover all the food safety hazards, nor was it able to explicitly quantify the magnitude of the economic burden of SPS measures due to limitations of time and data.

Food Safety and Regulatory Landscape

At the continental level, there are structures and policies to promote the implementation of food safety principles and measures for the protection of human, animal and plant health. Typically, the food safety regulatory landscape in African countries is fragmented, with food safety regulations falling under the responsibility of different institutions, agencies, and departments that carry out mandates independently, with minimal or no linkages and with some evidence of overlap. The current AU food safety policy framework seeks to strengthen efficiencies in intra-African trade under the AfCFTA through harmonization of SPS standards & border processes, sharing of information, and increased technical capacity. However, lack of harmonization in food safety legislation and regulations also poses a huge challenge in addressing issues to deal with non-conformity to prescribed standards and regulations for African countries and particularly the selected countries in this brief. Although, considerable work has been done through the African Organisation for Standardization (ARSO) and Regional Economic Communities (RECs) towards harmonization of standards at continental level, more work still needs to be done at member state level.

⁴ Burkina Faso, Ethiopia, Ghana, Kenya, Malawi, Mali, Mozambique, Nigeria, Rwanda, South Africa,

Uganda, United Republic of Tanzania, Zambia, Zimbabwe.

The absence of harmonized SPS measures coupled with various SPS constraints in several countries amplifies the challenges associated with the application of SPS measures. This has a negative impact on intra-regional trade, particularly for exporting countries, who are faced with significant economic costs.

Because of rapid urbanization and a growing middle class in Africa, regional and domestic markets in Africa are becoming increasingly important for small-holder farmers. When comparing production and commodity loss statistics of key value chains, significant losses are observed, yet there is untapped export potential in the region and particularly in the selected countries. The magnitude of product losses is an indication of inefficient value chains, and has significant impacts on income and food and nutrition security of the affected communities. Value chain constraints affecting smallholder farmers are typically production and market related. Further, farmers often lack information about the market for their produce and the potential for export. As a result of this lack of information, they are often unaware of the various trade opportunities, and are not appraised of the requirements necessary to meet market needs. Therefore, small-holder farmers find it difficult to benefit fully from the value chains they are already a part of. SPS capacity constraints are notably affecting trade in most of the selected countries. Although SPS structures are present at the REC level and in some of the selected countries, national SPS Committees are not functional, and not able to monitor implementation of SPS measures and help to resolve SPS constraints that arise and affect intra-regional trade. African countries are also not able to generate scientific evidence to support their SPS measures and strategies. This is often due to lack of institutional, scientific, and human capacity to implement SPS controls in harmony with regional or internationally harmonized standards and guidelines. Because national SPS systems are weak when SPS issues arise, countries often do not report them. There is also a greater risk of cutting out the smallholder farmers and MSMEs from the regional and global markets, especially women, due to prohibitive costs of compliance to market requirements. Further, the public health burden associated with consuming

unsafe food, compounded with the compromised quality of unsafe foods, may predispose affected populations to poor nutrition outcomes, and subsequently decreased productivity and poverty.

While there is demonstrated political will to expand intra-regional trade through the AfCFTA agreement, African countries face several challenges especially around issues on the implementation of SPS measures. These include;

- Lack of a clear continental institutional framework;
- Limited scientific data sharing that is used to create policy;
- Lack of awareness of SPS issues by all stakeholders (governments and private sector);
- Low priority among decision makers;
- Inadequate financial resources devoted to SPS issues;
- Slow pace in ratification of regional SPS protocols;
- Duplicated mandates among agencies at the national level;
- Weak public sector enforcement of SPS compliance measures;
- Inadequate or non-existent infrastructure, capacity, and laboratories; and,
- Weak national and regional coordination mechanisms.

Key Value Chains Susceptible to SPS Constraints

The key value chains in the table below were identified as susceptible to SPS constraints but important to increasing interregional trade due to high production, regional export potential, and national prioritization in the various national agricultural policies of the selected countries. Further, even though these key value chains are highly susceptible to food safety issues, it is important to note that there are currently few reported SPS issues and constraints between the selected countries relating to trade in these commodities. This however does not imply the absence of SPS constraints/issues, and this is a critical data gap in both the selected countries and the continent at large. There is therefore need to improve countries' capacity to generate and report SPS issues in a timely manner.

Key Value Chains and Associated SPS Issues

| Value chain (HS Code) | | No. of selected countries | Countries | SPS issues description ⁵ |
|---|----------------------------------|---------------------------|--|--|
|  | Maize (100590) | 12 | Burkina Faso, Ethiopia, Ghana, Kenya, Malawi, Mali, Mozambique, Nigeria, South Africa, Uganda, United Republic of Tanzania, Zimbabwe | <ul style="list-style-type: none"> - Mycotoxins (<i>Fusarium spp.</i>, Aflatoxin B1)^{a,b} - Genetically Modified (GM) content^a - Maize Lethal Necrosis^c |
|  | Raw Cane sugar (170199) | 11 | Burkina Faso, Ghana, Kenya, Malawi, Mozambique, Rwanda, South Africa, Uganda, United Republic of Tanzania, Zambia, Zimbabwe | <ul style="list-style-type: none"> - Pests and diseases^c - Extraneous matter^a |
|  | Rice (1006XX) | 10 | Burkina Faso, Ethiopia, Ghana, Malawi, Mali, Mozambique, Nigeria, Rwanda, United Republic of Tanzania, Zambia | <ul style="list-style-type: none"> - Mycotoxins (Aflatoxin B1)^{a,b} - Genetically Modified (GM) content^a - Pesticide residues^a - Microbiological hazards^a |
|  | Livestock (0102XX, 0103XX) | 9 | Burkina Faso, Malawi, Mali, Mozambique, Rwanda, South Africa, Uganda, United Republic of Tanzania, Zambia | <ul style="list-style-type: none"> - Foot and mouth disease^b - Bovine spongiform encephalopathy (Mad cow disease)^{a,b} - Swine fever^b - Porcine reproductive and respiratory syndrome^b |
|  | Bananas (080390) | 8 | Ghana, Kenya, Malawi, Mozambique, Nigeria, Rwanda, United Republic of Tanzania, Zimbabwe | <ul style="list-style-type: none"> - Fruit fly (<i>Bactrocera dorsalis</i>)^c - Microbiological hazards^a - Pesticide residues^a |
|  | Fresh vegetables/ fruit (0706XX) | 7 | Ethiopia, Kenya, Mali, Nigeria, South Africa, Uganda, Zimbabwe | <ul style="list-style-type: none"> - fruit fly (<i>Bactrocera dorsalis</i>)^c - Microbiological hazards^a - Pesticide residues^a |
|  | Palm oil (151190) | 6 | Ghana, Mali, Mozambique, Nigeria, Rwanda, Zimbabwe | <ul style="list-style-type: none"> - Chemical contaminants^a |
|  | Coffee (090111) | 5 | Ethiopia, Ghana, Mali, Rwanda, Uganda | <ul style="list-style-type: none"> - Mycotoxins (Ochratoxin A)^a - Pesticide residues^a |

⁵ a – Human health; b – Animal health; c – plant health

| Value chain (HS Code) | | No. of selected countries | Countries | SPS issues description ⁵ |
|---|------------------------|---------------------------|--|--|
|  | Black tea (090240) | 5 | Kenya, Malawi, Rwanda, United Republic of Tanzania, Zimbabwe | - Pesticide residues ^a - Extraneous matter ^a |
|  | Fish/Sea food (0303Xa) | 5 | Malawi, Mozambique, Nigeria, South Africa, Zambia | - Microbiological hazards ^a - Heavy metal residues ^a |
|  | Cashew (080131) | 5 | Mali, Mozambique, Nigeria, Uganda, United Republic of Tanzania | - Microbiological hazards ^a - Mycotoxins (Aflatoxins) ^a |
|  | Groundnuts (120242) | 5 | Burkina Faso, Malawi, Mali, Mozambique, Nigeria | - Mycotoxins (Aflatoxins) ^{a,b} |
|  | Soya beans (120190) | 4 | Malawi, Mozambique, Uganda, United Republic of Tanzania | - Pesticide residues ^{a,b} |
|  | Potatoes (070190) | 4 | Kenya, Malawi, Rwanda, South Africa | - Pesticide residues ^a - Bacterial and fungal diseases ^c - Pests ^c |
|  | Wheat (100119, 190219) | 3 | Ethiopia, Nigeria, Rwanda | - Mycotoxins (<i>Fusarium spp.</i>) ^{a,b} - Pesticide residues ^a |
|  | Cocoa (180100) | 3 | Ghana, Mozambique, Rwanda | - Mycotoxins (Ochratoxin A) ^a - Pesticide residues ^a |
|  | Sesame seed (120740) | 3 | Burkina Faso, Mali, Nigeria | - Mycotoxins (Aflatoxins) ^a - <i>Salmonella spp.</i> ^a - Pesticide residues ^a |

Economic Impact of SPS Measures on Regional Trade

Livestock and maize are the value chains with greater sensitivity to trade measures.



Maize

•SPS Issue 1 - Aflatoxins

- The aflatoxin problem in East African Community (EAC) countries has cost the region over US\$235 million between 2018 and 2021. The affected countries are Uganda, Kenya, U.R. Tanzania and Rwanda.
- The associated public health effects of aflatoxins have been estimated to be at least US\$580 million annually.

•SPS Issue 2 - Genetically modified content

- There was a significant decrease in maize imports by Kenya from South Africa due to Kenya's ban on genetically engineered food crops.
- There was also a significant decline in imports of maize from South Africa by Zimbabwe due to Zimbabwe's ban on GM maize
- Based on 2016 export volumes to Kenya and Zimbabwe, South Africa lost potential revenue of US\$105.52 million (ZAR1.734 billion) in potential maize exports to the two trading partners in 2017



Cattle

•SPS Issue - Foot and mouth disease

- Outbreaks of foot and mouth disease between 2017 and 2022 resulted in;
 - bans on livestock imports from affected countries.
 - restrictions on domestic livestock movements in the affected countries.
- The affected countries were Mozambique, South Africa and Zimbabwe.
- Economic costs associated with FMD in these territories emanated from;
 - culling diseased animals
 - increased surveillance costs
 - loss of revenue due to export and import bans
 - increased domestic prices due to shortages of the commodity.
- The exact economic cost could not be quantified due to lack of concrete data.



Poultry

•SPS Issue - Avian flu

- African governments are losing millions of dollars annually due to avian flu effects on the economy.
- Affected countries are Kenya, Rwanda, Uganda, United Republic of Tanzania, South Africa, Mozambique and Zimbabwe.
- Avian flu outbreaks occurred in South Africa, United Republic of Tanzania, Uganda and Zimbabwe in 2017 cost these countries and their trading partners over US\$800 million in revenue.
- Costs emanated from;
 - Export bans on poultry and poultry products.
 - Culling of infected birds.
 - Loss of domestic and regional markets due to shortages of poultry and poultry products.

Intervention Areas

Cognizant of the AfCFTA agreement and the AU food safety policy framework which seeks to strongly and consistently align African SPS systems with international science-based standards, there is need for African institutions and countries to do more towards the development of supporting mechanisms for the implementation of Annex 7 of the AfCFTA agreement. It should be noted that there is limited documentary evidence of SPS issues owing to poor reporting of incidents by member countries. Further, there is a significant proportion of informal trade due to the porous nature of most border posts, and informal trade data is difficult to capture. The absence of functional SPS reporting structures and limited SPS capacity in member countries gives rise to a large data gap, which makes it difficult to draw meaningful conclusions or evidence-based measures. There is therefore need to reduce SPS capacity constraints faced by member countries and to increase their capacity to report and address SPS issues and base their food safety measures on scientific principles. The Food Trade Coalition for Africa, working closely with regional economic communities (RECs) and national SPS committees, can contribute to increased food safety capacity in selected countries through capacity building in evidence-based prioritization of food safety hazards, and risk analyses in key value chains.

With a view to influence and/or advocate policy/regulatory reforms that are targeted at resolving food safety and nutrition constraints as well as strengthening food safety systems to increasing regional food trade, it is imperative for the stakeholders in food trade in Africa, through investments and/or technical assistance, to capitalize on the following areas of interventions:

- Collaboration with RECs, should promote the development of supporting mechanisms for the implementation of Annex 7 of the AfCFTA agreement, such as the development of a food safety toolbox for key value chains comprising value chain needs assessment, risk assessment, harmonized SPS regulations and mutual recognition frameworks, post-harvest management and SPS capacity building including quality assurance training.
- African governments through the relevant AU SPS structures, can increase food safety capacity through the development of a platform where African countries can register SPS issues and where progress on resolution can be communicated and tracked in real time.
- Working closely with national SPS committees to contribute to increased food safety capacity in selected countries through capacity building in evidence-based prioritization of food safety hazards, and risk analyses in key value chains.

References

- African Union, "Sanitary and Phytosanitary (SPS) Policy Framework for Africa," Sanitary and Phytosanitary (SPS) Policy Framework for Africa. African Union Department of Rural Economy and Agriculture, Addis Ababa, Oct. 2019.
- Calkins, C. M., & Scasta, J. D. (2020). Transboundary Animal Diseases (TADs) affecting domestic and wild African ungulates: African swine fever, foot and mouth disease, Rift Valley fever (1996–2018). In *Research in Veterinary Science* (Vol. 131). <https://doi.org/10.1016/j.rvsc.2020.04.001>
- Diao, X., Kennedy, A., Mabiso, A., & Pradesha, A. (2016). Economywide impact of maize export bans on agricultural growth and household welfare in Tanzania: A Dynamic Computable General Equilibrium Model Analysis. *Development Policy Review*, 34(1), 101–134.
- DALRRD. (2020). *A Profile of the South African Beef Market Value Chain: 2020*.
- FAO, ECA, and AUC, "Africa Regional Overview of Food Security and Nutrition 2019," Accra, 2020.
- S. Ehui, H. Kray, and E. Mghenyi, "Policy priorities for achieving food and nutrition security by 2030," AFRICA IN FOCUS, Jan. 30, 2020. <https://www.brookings.edu/blog/africa-in-focus/2020/01/30/policy-priorities-for-achieving-food-and-nutrition-security-by-2030/> (accessed Jan. 27, 2022).
- J. Daly, D. Hamrick, G. Gereffi, and A. Guinn, "Policy Brief 38202: Maize Value Chains in East Africa," Feb. 2017.
- Kamala, A., Shirima, C., Jani, B., Bakari, M., Sillo, H., Rusibamayila, N., de Saeger, S., Kimanya, M., Gong, Y. Y., & Simba, A. (2018). Outbreak of an acute aflatoxicosis in Tanzania during 2016. *World Mycotoxin Journal*, 11(3), 311–320.
- Kibugu, J., Mburu, D., Munga, L., Lusweti, F., Grace, D., & Lindahl, J. (2022). Mycotoxin Hazards in the Kenyan Food and Feed Market - A Retrospective Study. *African Journal of Food, Agriculture, Nutrition and Development*, 22(1). <https://doi.org/10.18697/ajfand.106.20995>
- Kimanya, M. E., Routledge, M. N., Mpolya, E., Ezekiel, C. N., Shirima, C. P., & Gong, Y. Y. (2021). Estimating the risk of aflatoxin-induced liver cancer in Tanzania based on biomarker data. *Plos One*, 16(3), e0247281.
- Knight-Jones, T. J. D., & Rushton, J. (2013). The economic impacts of foot and mouth disease - What are they, how big are they and where do they occur? In *Preventive Veterinary Medicine* (Vol. 112, Issues 3–4). <https://doi.org/10.1016/j.prevetmed.2013.07.013>
- Lewis, L., Onsongo, M., Njapau, H., Schurz-Rogers, H., Lubber, G., Kieszak, S., Nyamongo, J., Backer, L., Dahiye, A. M., & Misore, A. (2005). Aflatoxin contamination of commercial maize products during an outbreak of acute aflatoxicosis in eastern and central Kenya. *Environmental Health Perspectives*, 113(11), 1763–1767.
- Lukwago, F. B., Mukisa, I. M., Atukwase, A., Kaaya, A. N., & Tumwebaze, S. (2019). Mycotoxins contamination in foods consumed in Uganda: A 12-year review (2006–18). In *Scientific African* (Vol. 3). <https://doi.org/10.1016/j.sciaf.2019.e00054>
- M. Ndemera, M. de Boevre, and S. de Saeger, "Mycotoxin management in a developing country context: A critical review of strategies aimed at decreasing dietary exposure to mycotoxins in Zimbabwe," *Critical Reviews in Food Science and Nutrition*, vol. 60, no. 4, pp. 529–540, 2020.
- S. K. Gayi and K. Tsowou, *Cocoa industry: Integrating small farmers into the global value chain*. United Nations, 2017.
- Makgopa, M. (2022). *South Africa Attempts to Control Foot and Mouth Disease Outbreaks*.
- Makgopa, M., & Caldwell, A. (2021). *Poultry and Products Annual*.
- Masila, G., Mhando, K., & Echessah, P. (2022). *Impact of Grain Trade Restrictions Part 1: The Case of Kenya's Maize Import Ban of 2021*.
- Massomo, S. M. S. (2020). Aspergillus flavus and aflatoxin contamination in the maize value chain and what needs to be done in Tanzania. In *Scientific African* (Vol. 10). <https://doi.org/10.1016/j.sciaf.2020.e00606>
- O. Kula, "Evaluation of Sanitary and Phytosanitary (SPS) Trade Policy Constraints Within the Maize and Livestock Value Chains in West Africa," 2016.
- USDA FAS, "Food and Agricultural Import Regulations and Standards Report - Ethiopia," Addis Ababa, Dec. 2018.
- PACA. (2017). *Strengthening Aflatoxin Control in Tanzania: Policy Recommendations*.

- Pienaar, L. (2017). *Economic Impact Assessment of Highly Pathogenic Avian Influenza (HPAI) on the Agricultural Sector in South Africa*.
- Sitko, N. J., Kuteya, A. N., & Chisanga, B. (2014). Analysis of the Effects of Maize Trade Restrictions in the COMESA Region on Food Prices and Market Development. *Proceeding of COMESA and ACTESA Workshop: Indaba Agricultural Policy Research Institute*, 1–24.
- SADC. (2018). *SADC Regional Vulnerability Assessment & Analysis (RVAA): Synthesis Report on the State of Food and Nutrition Security and Vulnerability in Southern Africa 2018*.
- SADC. (2019). *SADC Annual Report: 2018-2019*.
- T. D. Morse, H. Masuku, S. Rippon, and H. Kubwalo, “Achieving an integrated approach to food safety and hygiene—Meeting the sustainable development goals in sub-saharan Africa,” *Sustainability*, vol. 10, no. 7, p. 2394, 2018.
- Tefera, T. (2012). Post-harvest losses in African maize in the face of increasing food shortage. *Food Security*, 4(2). <https://doi.org/10.1007/s12571-012-0182-3>
- van Helden, L. S., Sinclair, M., Koen, P., & Grewar, J. D. (2016). Description of an outbreak of highly pathogenic avian influenza in domestic ostriches (*Struthio camelus*) in South Africa in 2011. *Preventive Veterinary Medicine*, 128. <https://doi.org/10.1016/j.prevetmed.2016.03.019>
- UNICEF, “The state of food security and nutrition in the world 2021. Transforming food systems for food security, improved nutrition, and affordable healthy diets for all.” FAO, 2021.
- WTO, “COMESA Sanitary and Phytosanitary (SPS) Activities,” G/SPS/GEN/1744. World Trade Organization, Nov. 01, 2019.
- World Bank, *Improving health, nutrition and population outcomes in Sub-Saharan Africa: the Role of the World Bank*. The World Bank, 2004.
- World Health Organization. (2015). WHO estimates of the global burden of foodborne diseases: foodborne disease burden epidemiology reference group 2007-2015. In *World Health Organization*. <https://apps.who.int/iris/handle/10665/199350>