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EVALUATION OF SANITARY AND PHYTOSANITARY (SPS) TRADE POLICY CONSTRAINTS WITHIN THE MAIZE AND LIVESTOCK VALUE CHAINS IN WEST AFRICA

NIGERIA, GHANA, CÔTE D'IVOIRE, BURKINA FASO & MALI

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This publication was produced for review by the United States Agency for International Development. The author's views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

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ACRONYMS

AI	Avian influenza
ANADER	L'Agence Nationale d'appui au Développement Rural / National Agency for Rural Development Support (Côte d'Ivoire)
AQIM	Al Qaeda of the Maghreb
AU	African Union
CAADP	Comprehensive Africa Agriculture Development Programme
CBPP	Contagious bovine pleuropneumonia
CIF	Cost, insurance, and freight
CILSS	Comité Permanent Inter-Etats de Lutte contre la Sécheresse dans le Sahel
CRI	Crops Research Institute
CIMMYT	International Maize and Wheat Improvement Center
DAS	Direction de l'Action Sanitaire
DGSP	Direction Générale de la Santé Publique (Ministry of Health)
DGSV	Direction Générale des Services Vétérinaires (Ministry of Livestock and Fisheries)
DOC	Day-old chicks
DPVCQ	Direction de la Protection des Végétaux, du Contrôle et de la Qualité
DSV	Direction des Services Vétérinaires
DVPCS	Department of Veterinary and Pest Control Services (Federal Ministry of Agriculture & Rural Development, Nigeria)
EAC	East African Community
ECOWAS/CÉDÉAO	Economic Community of West African States/ Communauté Économique des États de l'Afrique de l'Ouest
EED	Environmental enteric dysfunction
ETLS	ECOWAS Trade Liberalization Scheme
EU	European Union
F2F	Farmer-to-Farmer
FAO	Food and Agriculture Organization

FCFA	West African CFA Franc
FDA	Food and Drug Authority
FDVPC	Federal Department of Veterinary and Pest Control Services
FMARD	Federal Ministry of Agriculture and Rural Development (Nigeria)
FMD	Foot-and-Mouth Disease
FODEL	Fonds de Developpement de l'Elevage
GCC	Gulf Cooperation Council
GDP	Gross Domestic Product
GGC	Ghana Grains Control
GHC	Ghanaian cedi
GMO	Genetically modified organism
GPS	Global Positioning System
GWR	Grain warehouse receipting program
ICT	Information and communications technology
IITA	International Institute of Tropical Agriculture
INERA	Institut National pour l'Etude et de Recherches Agricoles
INHP	Institut National d'Hygiène Publique
IPPC	International Plant Protection Convention
IT	Information technology
LANADA	Laboratoire National d'Appui au Développement Agricole (National Agricultural Laboratory)
LEO	Leveraging Economic Opportunities
LGB	Larger grain borer
LNSP	Laboratoire National de Santé Publique (National Laboratory of Health)
MADU	Municipal Agricultural Development Unit
MCH	Maternal and child health
MDMV	Maize Dwarf Mosaic Virus
MIS	Management information system
MLN	Maize Lethal Necrosis

MRL	Maximum residue level
MSV	Maize streak virus
MT	Metric ton
NAFDAC	National Agency for Food and Drug Administration and Control
NAPRI	National Animal Production Research Institute (Nigeria)
NAQS	Nigerian Agriculture Quarantine Services
NVRI	National Veterinary Research Institute (Nigeria)
OECD	Organization for Economic Cooperation and Development
OIE	World Organization for Animal Health (Office International des Epizooties)
ONVC	Order National des Vétérinaires de Côte d'Ivoire
PANVAC	Pan African Veterinary Vaccine Centre
PPR	Peste des Petits Ruminants
PROGIR	Programme de Gestion Intégrée des Ranches (Côte d'Ivoire)
PROSUMA	Société Ivoirienne de Promotion de Supermarchés
RCI	Republique du Côte d'Ivoire
SCMV	Sugarcane Mosaic Virus
SME	Small-medium enterprise
SPS	Sanitary and Phytosanitary
STTA	Saskatchewan Transport Training Association
TRAQUE	Trade Relations Assistance and Quality Enabling Programme
UEMOA	Union Économique et Monétaire Ouest-Africaine
USAID	United States Agency of International Development
USDA	United States Department of Agriculture
VACNADA	Vaccines for the Control of Neglected Animal Disease in Africa
VC	Value chain
VCD	Veterinary Council of Nigeria
VSD	Veterinary Service Directorate (Ghana)
WAD	West African dwarf

WASH	West African Short Horn
WATH	West African Trade Hub
WRS	Warehouse Receipt System
WSMV	Wheat Streak Mosaic Virus
WTO	World Trade Organization

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I. EXECUTIVE SUMMARY

This assessment of investment opportunities in the maize and livestock (poultry, cattle, and small ruminants) value chains across four countries of West Africa was carried out from April to June of 2016 as an activity under the Leveraging Economic Opportunities (LEO) project. This study is one of three African regional trade and SPS (sanitary and phytosanitary) assessments carried out in the East, Southern, and West Africa regions. The goal of this assessment was to “identify key constraints to trade (focusing on SPS measures) within the maize and livestock value chains in West Africa and to gauge opportunities for potential SPS related investments along each chain.”

The study had three objectives:

1. Assess SPS systems and trade constraints within targeted value chains
2. Identify SPS-related investment opportunities
3. Assess trade impacts

This report summarizes the key findings from this assessment. Section 2, “Study Objectives,” and Section 3, “Methodology and Approach,” provide an overview of the assignment’s goals and research methodology. Section 4, “West Africa Regional Conventions and Regulatory Institutions,” highlights regional SPS bodies and issues. Section 5, “Value Chain Snapshots,” delves into the key findings for each commodity and identifies the SPS hazards at each point along the value chain. Section 6, “Trade Impacts of SPS issues,” estimates key economic and human impact from these SPS-issues, and Section 7, “Priority Opportunities for Investment,” highlights key investment opportunities, organized by value chain.

The LEO consulting team used a value chain approach to identify opportunities for increased trade within national borders, and within and beyond the Economic Community of West African State/ Communauté Économique des États de l’Afrique de l’Ouest (ECOWAS/CÉDEAO) region. This approach drew on extensive primary and secondary sources, as well as interviews conducted with public and private stakeholders from producers downstream to the final market, in four focus countries—Burkina Faso, Côte d’Ivoire, Ghana, and Nigeria. The interviewees included the providers of critical services specific to the maize and livestock value chains, representatives of the ECOWAS/Union Économique et Monétaire Ouest-Africaine (UEMOA), national and sub-regional representatives responsible for trade, regulation, and promotion of the focus commodities, as well as public agencies responsible for SPS (including food safety) in the four focus countries. In addition, the consultant team met with regional and national institutions in Bamako, Mali.

Key Takeaways

- The SPS cost to trade far exceeds all other externalities attached to the trade in maize and livestock (other than the cost of the commodity itself).
- Private-sector actors who serve export or high-end domestic markets drive demand for stronger SPS controls and should be included in setting SPS priorities.
- Bi-lateral alignment with in ECOWAS/ CEDEAO SPS frameworks may be easier than community-wide harmonization since as national policies are sometimes at odds with regional accords and national parliaments are slow to consider and pass ECOWAS rules.
- Investment in strengthening testing capacity at or near border points is high value for money.
- Government seed policy is a driving constraint to widespread access to high-quality hybrids for smallholders.
- The causal link between aflatoxin and stunting warrants joint agriculture and maternal and child health (MCH) investment.

SPS SYSTEMS AND TRADE CONSTRAINTS

UEMOA and ECOWAS have harmonized SPS regulations but have largely avoided imposing SPS constraints on cross-border ruminant trade because of fears that these would excessively disrupt trade, forcing it into informal channels and thus worsening animal-health problems. Instead, they have focused on infrastructural investment that benefits member states but, with the exception of support to laboratories, does not target core processes that might improve animal health, plant health, or food safety; or that might make regional trade more efficient.

Trade is driving the demand for improved SPS systems. Domestic companies seeking to export and multinational companies (e.g., Nestlé or breweries) serving domestic markets largely drive demand for improved SPS compliance. Failure to comply with regional, global, and importing country SPS standards means the loss of sales, revenue, and hard currency. Product that companies based in ECOWAS countries export to destinations outside ECOWAS is held to higher scrutiny than sold domestically product. Companies exporting processed foods with maize as a key ingredient were very concerned about pesticide and aflatoxin levels because the country of destination might test their products. Companies potentially exporting red meat beyond ECOWAS borders do not yet exist because of SPS shortfalls.

West African countries have not been able to achieve the World Trade Organization (WTO) standards at a volume and consistency to be competitive in export markets. Many countries within the region do not produce sufficient amounts of these commodities to appease domestic consumption and to permit exports. As West African countries strive to attain the international standards in the longer term, the short and medium-term focus for these commodities should focus on stimulating and promoting internal and regional trade.

National policies are frequently at odds with ECOWAS/CÉDÉAO accords. ECOWAS/CÉDÉAO's mandate is to create a regulated common market within the regional community, but it has no enforcement power. National parliaments are slow to consider and pass ECOWAS rules, a prerequisite for these rules to acquire the force of law. The voices of private actors who bear the costs of non-compliance must be more involved in setting the SPS agenda.

Enforcement of compliance. In conformity with WTO rules, ECOWAS member states formally allow the free movement of agricultural commodities across the borders of member states, providing that commodities comply with International Plant Protection Convention (IPPC), World Organization for Animal Health (OIE), and Codex Alimentarius (Codex) standards. However, compliance, inspection, testing, and enforcement pose significant challenges to resource-constrained states.

Borders between ECOWAS' 14 continental member states are porous, due to 25 internal borders with a total length of 15,000 kilometers and to a lack of resources to monitor cross-border movement effectively. This is especially true for live animals, notably cattle and small ruminants. All official border control points maintain both plant and animal health inspectors, though some inspectors in remote areas are responsible for more than one border crossing, making it difficult to serve adequately. Major border crossings can quarantine animals suspected of disease and, in the event of confirmation, order their slaughter. Corruption and the collection of illegal payments at borders and many inland control posts add 1–6 percent to the cost, insurance, and freight (CIF) cost of goods. Though this cost is not negligible, it is relatively minor compared to the loss of product value and the public health costs from consumption of toxins and pathogens in food.

Plant and animal health begins on the farm or open range and flows downstream to their final markets. Striga, maize viruses, and insect pests result in reduced productivity and increased post-harvest losses. Treatment for mycotoxin-contaminated soils is only available in Nigeria, where it is underused and misallocated due to a lack of testing kits. Further mycotoxin contamination results from poor storage conditions. Improper storage and post-harvest practices further introduce risk of rodent and insect damage and feces mixed with grain. Importing countries have imposed export bans based on improper use of pesticides and/or use of banned pesticides, resulting in a considerable loss of revenue to the exporting country. Education of all value chain actors whose actions can exacerbate or mitigate SPS hazards is essential to address these problems.

On the livestock side, bovine, small ruminant, and avian diseases reduce productivity and increase mortality by as much as 30 percent. Para-veterinarians or community animal health workers equipped and trained to use vaccines could greatly increase animal vaccination rates. However, these efforts have largely been abandoned due to a lack of financial incentives. Privatizing vaccination services and paying para-vets on a commission basis could help revitalize this important link; however, this will raise concerns about proper use and disposal of veterinary drugs. All the countries visited have poorly controlled systems to dispose of diseased animals. Abattoirs and slaughter slabs are sites of contamination of non-diseased carcasses by diseased ones. For animal diseases that cross over to humans (e.g., avian influenza, bovine tuberculosis, etc.) this contamination poses significant public health risks. The absence of abattoirs meeting international standards is a lost export opportunity for ECOWAS members¹. Until one member either builds and operates one, or creates the conditions favorable for investment in one, this potential opportunity remains untapped.

Food safety and the human cost of SPS issues. Nigeria estimates 200,000 deaths from foodborne toxins and pathogens annually. There is little evidence that the per capita incidence is significantly lower in neighboring countries. Aflatoxin and mycotoxins, long understood as carcinogens, appear to be a significant factor in childhood stunting. Studies now recognize that stunting is more likely to result from environmental enteric dysfunction (EED) than from poor nutrition. Children's exposure to fecal-borne pathogens and to toxins, including aflatoxin, cause EED. The economic cost of stunting to West African states is enormous in terms of lost worker productivity and reduced intellectual development of affected children. Public awareness of the link between mycotoxins and stunting is non-existent. Low maize productivity resulting from a lack of vibrant hybrid seed access leaves inhabitants of most member countries hungry for whatever maize they can get, almost regardless of quality, especially in the Sahelian countries' pre-harvest "hungry season." Public concern for the presence of mycotoxins in maize is unlikely to be resolved until countries reform their seed policies to permit and encourage the development of seed markets for high-yielding hybrid varieties. Human consumption of antibiotics from recently vaccinated livestock is also a problem. Animals that appear sick after vaccination are often rushed to slaughter to minimize their owners' economic losses, resulting in antibiotic residues in the animals' flesh.

The links between (a) aflatoxins and EED and (b) EED and stunting should elevate the importance of aflatoxin control on the national level. Apart from public officials within SPS regulatory bodies, SPS is not perceived as a high priority, unlike other public health threats with higher and shorter-term mortality and morbidity, like malaria, diarrheal diseases, and non-aflatoxin factors contributing to stunting and wasting.

¹Though there is clear excess demand from GCC and Indian Ocean states, and prices of meat on and off-bone in ECOWAS member capital markets were found to be higher than in Dubai. A careful market analysis, including an assessment of the timing of potential opportunity windows, should be a precondition for any investment in slaughtering for export.

However, new research establishes a causal connection between aflatoxicity in infants and children and stunting through EED. More research on the degree of causality between aflatoxicity and stunting will encourage eventual public health campaigns.

Other SPS costs. Failure to comply with global SPS standards generates important loss of revenue due to export bans both within and outside of the ECOWAS member states. ECOWAS countries do not export maize outside of the ECOWAS region in significant numbers, but bans from excessive pesticide maximum residue levels (MRLs) in other commodities hit hard, especially in countries suffering from a loss of petroleum and gas revenues. Under-resourced regulatory agencies in the four focus countries offer SPS certificates on commodities without actually inspecting them. Officials often issue SPS certificates in the capital cities, although the traded commodity may originate from distant points. We identified multiple instances where the delivered maize fell far short of the negotiated quality. The recent avian influenza (AI) outbreak resulted in a ban on trade in all poultry products by all the countries included in this study. Prior to this ban, the biggest poultry flows were the export of traditionally reared chickens (and guinea fowl) from Burkina Faso, particularly to Côte d'Ivoire, but also to other West African neighbors, and the sale of day-old-chicks (DOCs), from Côte d'Ivoire and Ghana into Burkina Faso.

Recognition, standards, and harmonization. Consistency of standards and confidence in their application would do much to increase both regional trade and exports. UEMOA members succeeded in formally harmonizing their national SPS regulations, perhaps due to a shared legal framework, a shared currency, and stronger cultural ties. However, the enforcement capacity in UEMOA member states is weaker than in Ghana and Nigeria, both of which have a greater number of national-level regulatory agencies. Both Ghana and Nigeria have established Food and Drug Authorities (FDA), based on the United States' FDA model. Harmonization of SPS rules across ECOWAS is likely 10 years away, but recognition of each member's rules and regulations by the others would be an important and much more easily achieved step. Of the four countries visited, only Ghana has standards set for maize; the Ghana Standards Authority works closely with a private industry association, the Ghana Grains Council, to enforce these standards. Given that national policies are sometimes at odds with ECOWAS/ CÉDÉAO accords, and that national parliaments are slow to consider and pass ECOWAS rules, it may be easier in the short-run to support individual countries to pass their own SPS frameworks (that align with ECOWAS/CÉDÉAO) rather than regionally established ones.

Resources allocated at the national level are insufficient to ensure SPS controls, inspection, testing, and enforcement. While public resources in developing economies are scarce, public resource allocation remains a priority measure. None of the four countries dedicates sufficient resources to ensure compliance with, or to enforce SPS regulations through inspection and testing. Relatively low-cost test kits for aflatoxin in soil and maize are not available. Most borders lack meters to measure moisture levels, which serve as a proxy for aflatoxin risk. National laboratories generally suffer from some combination of poor infrastructure, insufficient equipment, and duplication of effort between labs. Where they depend on front-line government agents to gather samples for analysis, they may have weak links to, and poor coordination with, the relevant government agencies, so that sampling protocols may not result in optimal tests. By extension, government agents are generally under-equipped to play a role in the testing system. They may also be under-motivated due to low salaries, poor working conditions, or threats received from traders, butchers, or government security officers. Private laboratories are also underused.

Insecurity reduces the ability and the priority of governments to ensure SPS compliance. Boko Haram in northern Nigeria, Al Qaeda of the Maghreb (AQIM), as well as regional domestic conflicts between pastoralists and agriculturalists hinder trade and impede the work of regulatory and enforcement agencies.

Trends. Traceability for livestock, maize, and all other agricultural commodities will become more important and easier to provide with advances in information technologies. The opportunity cost of contaminated product is too high to ignore. Though we found no evidence of consumer groups dedicated to food safety in any of the four countries studied, public awareness of food safety issues is growing rapidly. National newspapers and FM radio routinely report on food safety and public health issues. West Africans returning from the diaspora, where public awareness of pesticide and antibiotic residues, aflatoxins, and pathogens is much greater, rightfully clamor for domestic food to be as safe as the food exported from their countries. Consumer demand for greater SPS controls will continue to increase.

VALUE CHAIN SPS ISSUES

Maize Value Chain SPS Issues

Low maize productivity appears to be a driver of indifference to SPS compliance. Low yields prevail throughout West African states, barely reaching 2.0 tons/ha. Regional maize production does not cover consumption. Yields remain low, despite the existence of hybrids developed by national research agencies, alone or in collaboration with the International Institute of Tropical Agriculture (IITA) and the International Maize and Wheat Improvement Center (CIMMYT), and by multinational seed companies. With the exception of Nigeria and Burkina Faso, government institutions have failed to create a market for domestically developed hybrids and have simultaneously erected multiple non-tariff barriers to multinational seed companies. Food security is a higher national priority than SPS issues, especially in the context of climate change. As one senior official stated, “Empty bellies do not complain about quality.”

National agendas impede passage of ECOWAS seed policies. Each member country has a domestic seed sector. National policies that impede the emergence of private regional seed markets protect these largely inefficient sectors. In the maize market, nationalist alliances have persuaded governments to erect barriers to entry for multinational seed certification and for multinational seeds. Meanwhile, the farmer pays the opportunity cost of low productivity. This is purely a political problem.

Regional food processors who export and multinational companies serving regional markets have the highest concern for SPS compliance. Regional exporters must comply with WTO SPS rules. Therefore, they must insure that their inputs comply. Multinational food and beverage companies are unwilling to risk loss of global markets from failure to comply at the national level. These two groups of firms are poised to demand greater attention to the SPS agenda.

Only Ghana has grades and standards for maize. The Ghana Grains Council, a membership association, conducts training and compliance inspection as part of its warehouse-receipting program. The absence of regional standards is an impediment to trade.

Misuse of pesticides and fumigants is a significant SPS hazard, though excess residues on export commodities draw greater attention. Causes include:

- Late application of pesticides leaving residue in maize
- Counterfeit pesticides may contain banned substances or have poor controls of concentration resulting in poor application controls
- Excessive dosing of pesticides in the field and fumigants in storage
- Improper disposal of approved pesticides and or fumigants

- Use of banned pesticides in the field
- Improper use of fumigants in maize storage

Maize SPS hazards carry into the poultry subsectors. Maize constitutes 65 percent of poultry feed by weight. Mycotoxins and excessive pesticide residues in maize concentrate in poultry organs, resulting in increased bird mortality and morbidity.

Livestock Value Chain SPS Issues

Better vaccination schemes. Though ruminant health has improved markedly over the decades, it is still poor by international standards. Governments organize national vaccination campaigns against the major infectious diseases, but coverage sometimes does not reach the approximate 80 percent level that achieves herd immunity. Governments should commit resources to vaccination campaigns to ensure that they meet their coverage goals.

Difficulties setting up private vet practices. Though ECOWAS countries encourage veterinarians to set up private practices, the cost of doing so is prohibitive. Therefore, veterinary clinics are rare in remote areas, leading to limited veterinary care and frequent use of informal-sector veterinary care. Loan guarantees may lead banks to extend more credit for this purpose, but banks are wary of investments in the private veterinary sector because they do not understand its risk profile. Support for bank loan officer training on the risk profile of the livestock sector, alongside limited loan guarantees, would likely result in credit for rural veterinary care. An alternative, lower-cost approach to making veterinary care available in more remote areas and increasing the use of approved veterinary medicines is to expand the use of para-vets operate as subsidiaries to a central veterinary clinic/pharmacy. Para-vets have basic formal veterinary training and carry a well-stocked kit of approved veterinary medicines.

Slow approval of veterinary medicines. The government of Burkina Faso has been slow to approve the import of a range of veterinary medicines for different needs, creating less competition in the domestic market between substitutable products and keeping prices high. Herd owners react by using fewer approved products and by using unapproved, illegally imported drugs that may be inert or harmful. Therefore, animal health suffers. Increasing the range of approved veterinary medicines would lower prices and raise the proportion of approved medicines administered. In order to avoid duplication of effort across countries, ECOWAS or UEMOA could authorize the testing of veterinary medicines in one or more regionally certified laboratories and maintain an up-to-date list of approved products that all countries could share.

Need for better border-post control for veterinary health. Most border posts lack quarantine facilities, which have largely fallen into disuse or disappeared since the eradication of rinderpest in the 1990s. Border animal-health checks are meaningless, not only because veterinary agents at these posts generally have no diagnostic equipment or links to laboratories to send samples for analysis, but also because they have no facilities to detain suspect animals. Further, personnel sometimes oversee multiple posts with little motorized transport and therefore cannot fully monitor the health of cross-border ruminant flows.

Need for improved domestic vaccine production, management, and distribution. Domestic vaccine production in the focus countries is extremely limited, often leading to livestock vaccination levels at a fraction of targeted figures (the aforementioned approximately 80 percent) for effective disease control. Low production levels stem from factors such as meager public funding, poor maintenance of vaccine manufacturing machinery, and unreliable and costly resources (e.g., electricity and water) needed for the manufacturing pro-

cess. Management is ineffective or constrained by the general lack of operational resources to ensure production and access to vaccines for livestock actors. Distribution looms as a daunting challenge due to the lack and cost of cold-chain facilities and poor infrastructure (e.g., roads to transport these vaccines). Across the region, and in most of sub-Saharan Africa, vaccine production is through the discovery and development of vaccines by national research institutes. The inability to scale and provide vaccinations to the necessary number of animals hampers this industry. This is true with the National Veterinary Research Institute in Nigeria.

SPS standards and practices are still too poor to generate exports from West Africa in the short term.

Buyers from the Middle East and other African nations have expressed interest and even developed strategies to partner with ECOWAS countries to purchase slaughtered sheep and goats. Yet viewing the abattoir facilities and the conditions and practices for slaughter deter these prospective buyers. Potential for large-scale exports does exist, but will require significant upgrades.

Traceability systems do not exist, yet a growing and wealthier middle class care about the origins of their meat. Several factors contribute to the absence of a traceability system for livestock, including the multi-link value-chain from a herder in the Sahel to a consumer in a coastal country that makes obtaining and tracking information challenging and unreliable. However, with increases in income growth and urbanization, consumers will likely demand more information about the origins of their meat to ensure it is not contaminated. The potential exists to link Sahelian ruminant producers, who produce the least diseased animals, more directly with supermarkets in coastal countries, making traceability more manageable.

Poultry Value Chain SPS Issues

Most West African countries are far from being self-sufficient in poultry production, and will need to rely on imports as consumption of poultry continues to grow. In parallel with red meat consumption, as consumers become wealthier in West Africa they will purchase more white meat. Domestic production of layers and broilers is still starkly insufficient, and countries such as Ghana will need to rely on international imports unless they can produce significantly more maize.

Sixty to 70 percent of the cost of poultry production is maize feed. Coastal countries where humid conditions are more conducive to aflatoxin produce most maize feed, creating a challenge for detecting and controlling the spread of this mycotoxin. Poultry producers suffer due to the mortality and morbidity of their birds, and consumers suffer from the cost to their health.

Despite being under-resourced, West African countries have responded quickly to stem the avian influenza epidemic. ECOWAS-member response to the recent AI epidemic was decisive but slow, resulting in the destruction of over two million birds. Despite this action, the AI epidemic continues. Reducing the biohazards related to mixing flocks in open markets and from backyard flocks remains a challenge. Bird crates, egg cartons, and the footwear of value-chain actors exposed to contaminated birds all remain serious sources of infection.

Avian influenza and similar epidemics can lead to the decimation of a country's poultry sector for extended periods. Without effective biosecurity measures, epidemics such as AI can emerge or re-emerge. Producers must destroy their entire flocks and abandon their livelihoods, often with low compensation rates and delayed payments. These epidemics severely affect all actors along the value-chain, with consumers reducing their demand for white meat until the epidemic ends. Countries have implemented import bans on live birds, but AI illustrates how poor biosecurity measures can negatively affect a sector.

OPPORTUNITIES FOR INVESTMENT TO PROMOTE TRADE

Critical opportunities for increased regional and export trade in the maize and livestock sectors in West Africa exist. The successful exploitation of these opportunities requires both public and private investment. Below is a consolidated table of this report’s recommendations for prioritized investments, which could serve as potential game changers to advance the SPS agenda and increase trade in West Africa. They are organized by “SPS—General,” “Livestock (poultry, cattle, and small ruminants),” and “Maize.” For a more exhaustive and detailed list of investments, including the ones mentioned below, please refer to Section 7: Priority Opportunities for Investment.

Table 1 - Prioritized Investments

Investment	Key counterpart bodies	Potential difficulties	Target countries
SPS—general			
Creation of regional public-private fora to establish SPS priorities.	ECOWAS, UEMOA, National Plant Protection bodies, National SPS committees and subcommittees, industrial food, feed mills and breweries, maize industry associations, chambers, public-health agencies, consumer associations.	Challenges to building consensus between public and private perspectives. Turning talk into action. Sustaining public-private dialogue with limited donor funds.	Countries with significant and expanding maize-processing capacity: - Ghana, Nigeria, Côte d’Ivoire, Senegal. - Other countries with significant maize production: Burkina Faso, Mali
Livestock (poultry, cattle, and small ruminants)			
Re-establish para-vet system under supervision of licensed public and/or private veterinarians.	National veterinary services regulatory agencies; EU’s Vaccines for the Control of Neglected Animal Disease in Africa (VACNADA) project, the Pan African Veterinary Vaccine Centre of the African Union (AU/PANVAC), private veterinarians.	National government concerns with allowing para-vets to vaccinate Inadequate supervision of para-vets Inadequate supply and/or quality of veterinary products Inadequate cold chain for storage and transport of vaccines Time required before para-vets can earn a reasonable income from service provision Cost of para-vet system still renders a loss	All

Table 1 cont.

Investment	Key counterpart bodies	Potential difficulties	Target countries
Cost-share grant support to private abattoirs to upgrade and obtain quality standards for high-end domestic and export markets.	National ministries of agriculture & livestock; national veterinary services; public and private abattoirs; private abattoir management companies.	Lack of investor funds Domestic market demand does not pay for upgrade Domestic prices not competitive in export markets	Nigeria, Ghana, Côte d'Ivoire, Burkina Faso
Support value upgrading of Sahelian livestock chains near urban centers, including fatteners, breeder investment in crossbreeds, improved feed and fodder mixes, and traceability to provide regional supermarkets with a higher quality and disease-free product.	Peri-urban fatteners in Sahelian countries; private abattoirs; supermarkets or other importers in the Sahelian and coastal countries; shipping companies (truck/air); banks; ministries of livestock and trade; West African Trade Hub	Lack of infrastructure Lack of shipping infrastructure and cold-chain facilities Difficulties obtaining credit	Initially Mali, Burkina Faso, Côte d'Ivoire, Ghana, Nigeria, and then the rest of ECOWAS.
Maize			
National testing on aflatoxin biopesticide Aflasafe BF 01 developed by the Institut National pour l'Etude et de Recherches Agricoles (INERA) in collaboration with IITA.	INERA, IITA Ministries of Food and Agriculture Commercial and smallholder farmers	Commercial production of Aflasafe BF 01 requires an investment in laboratory/production plants	Ghana, Burkina Faso, Côte d'Ivoire.
Support development of private commercial seed markets. This requires conditional licensing of multiplication and distribution rights of public domain seed to firms with the capacity to meet conditions.	National seed agencies, seed multipliers, seed companies, national parliaments.	Perceived threat by seed multipliers and national seed regulators	All ECOWAS countries except for Nigeria, which has already done this.
Harmonize national seed policies with the ECOWAS framework.	National seed research and certification bodies, private seed multipliers, seed companies, customs and security services. The set of private stakeholders willing to advocate for national ratification of harmonized policy.	Protectionism of national seed bodies Barriers to exports by countries trying to prioritize domestic demand	ECOWAS countries.

2. STUDY OBJECTIVES

USAID's Bureau for Food Security commissioned this study under the Leveraging Economic Opportunities (LEO) project. LEO's project goal is to deepen and widen the capacity of USAID staff and development partners to use evidence-based best practices when designing new projects and activities that promote inclusive market development, to manage their implementation effectively, and to evaluate their results.

The goal of this assessment was to use a value-chain approach to identify key constraints to trade (focusing on SPS measures) in the cattle, small ruminants, poultry, and maize value chains (VC) in West Africa, and to gauge opportunities for potential SPS-related investments along the chain. The analysis focuses on SPS needs and issues within the value chain, bringing together a wealth of knowledge about the targeted value chains by inventorying key SPS constraints that prohibit VC development and by prioritizing solutions to address identified SPS/VC constraints.

The primary objectives of this study were to:

1) Assess SPS systems and trade constraints within targeted VCs

- Assess the current SPS systems and known SPS barriers to trade in the region; ECOWAS standards and how they are applied; laboratory availability and capacity; and the use of SPS and other grades and standards in contracting across the focus FTF value chains.
- Map the institutional profile of the VCs (public, private, and community-based) to determine the identity, strengths, and weaknesses of key actors.

2) Use existing assessments, analysis, and studies as basis for work

- Identify SPS-related constraints along the VC that affect regional trade of maize and livestock in West Africa. This included looking at connectivity, requirements, and opportunities related to the impact of global markets on the VCs.
- Assess the relative importance of SPS issues in constraining regional trade flows of the focus commodities.
- Reflect and link to Trade Africa expansion work underway in Senegal, Côte d'Ivoire, and Ghana.

3) Identify Investment Opportunities

- Map current initiatives relevant to addressing barriers to investment identified under Objective 1, and identify priorities among issue areas.
- Analyze SPS constraints to the development of sectors and examine possible solutions with the understanding there are other investment efforts through partners.
- Utilizing the VC gaps/constraints identified under Objective 1, identify and prioritize regional and country-level opportunities to increase private and public investment flows. Prioritized opportunities are realistic, time sensitive, and take into account the relative impact on SPS barriers and the return on investment. Proposed investments to alleviate the identified constraints fall in several categories, such as:
 - Policy
 - Infrastructure and other assets

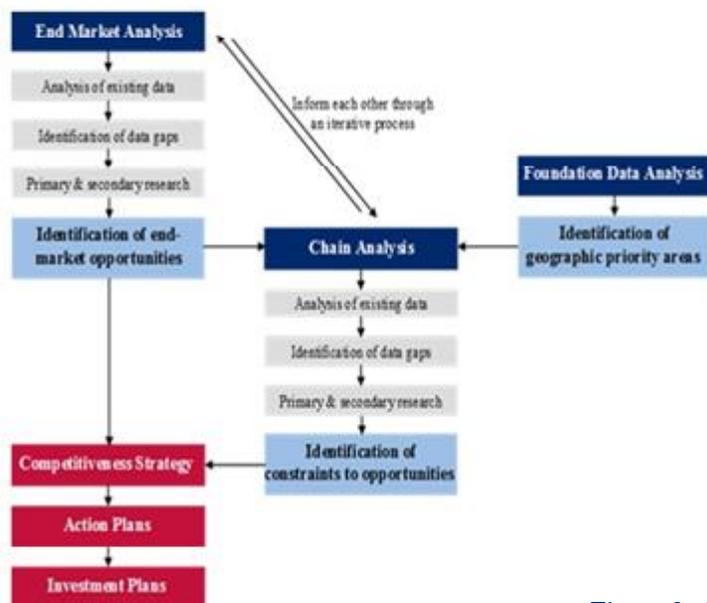
- Human and institutional capacity building
- Financial services
- Market information systems
- Science and technology (including ICT)
- Conflict
- Market governance

3. METHODOLOGY AND APPROACH

The LEO consulting team conducted this study by following the value chain methodology in Figure 1. Figure 2 illustrates the regional policy environment in which these value chains operate. Please note that Figure 2 is specific to maize.

This study surveyed four countries—Nigeria, Burkina Faso, Ghana, and Côte d’Ivoire—with a reduced survey of Mali. Criteria for country selection included a balance of Francophone and Anglophone countries, inclusion of maize-producing and livestock-producing countries, and sufficient security to allow free movement of consultants. Nigeria not only meets the above requirements, but is also the largest economy in the region and in Africa.

Figure 1 - Value Chain Analysis Process

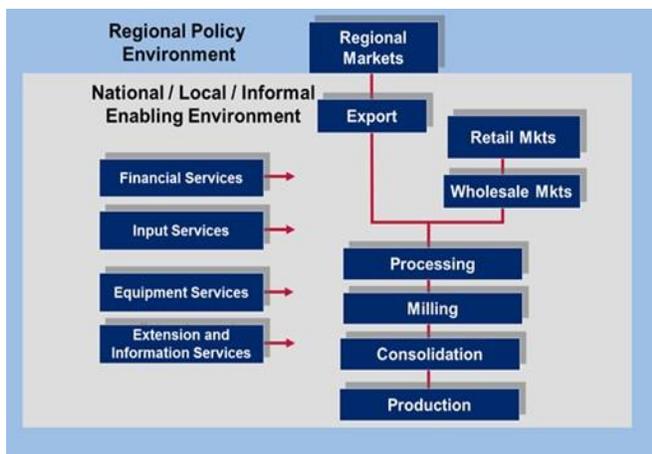


The first step in the process was to assess the selected countries’ basic competitiveness in the identified commodities. This step is essential because commercial investments will be difficult to secure if a country cannot be competitive in the production of a particular commodity.

To ensure efficiency, the team began with a review of the available secondary research on the selected countries’ economies, existing value-chain assessments of the selected commodities, and a literature review on SPS issues. This background research enabled the team to focus intelligence gathering on the fieldwork part of the analysis.

The field data-collection process took place over six weeks between late April and early July 2016. Primary field data collection included interviews with 187 strategic actors at each step of the selected commodity value chains, from producers upstream to final markets, providers of services essential to the operation of these value-chains, and public-sector agents who manage the downstream political and regulatory enabling environment for the commodity sectors and for national and regional SPS issues. For a complete list of primary and secondary data sources, see Annex I and the Bibliography.

Figure 2 - Regional Policy Environment



4. WEST AFRICA REGIONAL CONVENTIONS AND REGULATORY INSTITUTIONS

This section outlines key SPS systems in West Africa and then discusses issues associated with these systems.

WORLD TRADE ORGANIZATION (WTO)

ECOWAS members are part of the WTO, and automatically have to adopt the latter's SPS Agreement. Under this agreement, ECOWAS countries transitively adhere to the SPS standards and guidelines prescribed by the IPPC, OIE, and Codex, provided they do not constitute an unjustifiable restriction to trade. SPS measures include laws and regulations, inspection and certification procedures, treatments, and a range of technical activities. Countries possess the flexibility to implement SPS measures at their own discretion to meet the objectives in the agreement, and can impose higher standards with scientific justification.

- Codex—sets the standards on food safety
- IPPC—provides the standards on plant health
- OIE—provides the standards on animal health

WTO's SPS agreement requires each country to notify the WTO of animal pests, toxins, residues, and diseases identified within its territory.

ECOWAS/CÉDEAO

ECOWAS is a group of 15 countries (Anglophone and Francophone) in West Africa, promoting regional economic integration. In 1979, members took the first step towards establishing a common market with the introduction of the ECOWAS Trade Liberalization Scheme (ETLS) guaranteeing the free movement of transport, goods, and persons within the region.

Unfortunately, ECOWAS member states do not yet fully implement or enforce many of the sound protocols that exist on paper. The differences in the administration and pattern of governance of the member countries tend to affect the implementation of policies and agreements. In 2014 at Malabo, Equatorial Guinea,

WTO Article 4 Mutual Equivalence

Effective October 24, 2001

1. Members shall accept the sanitary or phytosanitary measures of other Members as equivalent, even if these measures differ from their own or from those used by other Members trading in the same product, if the exporting Member objectively demonstrates to the importing Member that its measures achieve the importing Member's appropriate level of sanitary or phytosanitary protection. For this purpose, reasonable access shall be given, upon request, to the importing Member for inspection, testing, and other relevant procedures.
2. Members shall, upon request, enter into consultations with the aim of achieving bilateral and multilateral agreements on recognition of the equivalence of specified sanitary or phytosanitary measures.

ECOWAS member countries agreed to adopt SPS measures in order to meet international standards (OIE, IPPC, and Codex), as well as to facilitate trade among member countries and improve food security.

Mutual Equivalence. ECOWAS member countries recognize mutual equivalence concerning SPS certificates. This means an SPS certificate issued in one country should be valid in the neighboring country and the region. In practice, border authorities usually request that importers pay for a new country certificate. These SPS certificates should be free but often are not; procedures and paperwork cost money and take time, constraining trade. Border authorities may superimpose bribes on cross-border costs.

UEMOA

The Union Économique et Monétaire Ouest-Africaine (UEMOA) is a monetary and economic union of seven Francophone and one Lusophone country in West Africa. Ghana and Nigeria do not belong, but the SPS measures of these two countries' neighbors affect UEMOA's ability to prevent and control diseases nationally. The French language permits improve coordination on SPS among Francophone nations but is a barrier for Anglophone countries.

UEMOA accepts that the SPS regulations in its 2007 SPS treaty were legally inconsistent and muddled by specifying implementation mechanisms, rather than leaving these for individual member states to choose. For this reason, and because UEMOA and ECOWAS have since agreed to work together towards a common framework for regional integration, from 2011 onwards the two regional organizations have been slowly harmonizing their SPS regulations that should allow individual countries to decide how to put them into effect. It is not clear how much the private sector and other interested parties have been consulted, when the two organizations will make their proposed regulations public, or how (and over what period) they propose that member states should implement the regulations. It is also unclear if implementation will be uniform across all ECOWAS member states, rather than supported and directed by UEMOA in its member states and by ECOWAS in non-UEMOA member states.

UEMOA prefers not to impose SPS constraints on cross-border ruminant trade because it fears that these would excessively disrupt trade and force it into informal channels, worsening animal-health problems. In-

Harmonization of ECOWAS Seed Policy Constrained by National Parliaments—The Case of Ghana

ECOWAS Member States are required to publish (or gazette) ECOWAS legal instruments, and **the harmonized ECOWAS Seed Regulation should supersede national legislation without requiring domestication.** Constitutionally, however, Ghana's Parliament must ratify the ECOWAS Regulation before it can go into effect, which effectively requires an affirmative act of domestication before the ECOWAS Regulation can be implemented. Further, in practice, Ghana's national level instruments and procedures need to be aligned with the ECOWAS Seed Regulation. This includes both the needs for Seed Regulations that are aligned with the ECOWAS Seed Regulation and changes in quality control processes, including the actions of agents, field border officials, and seed inspectors who will often refer to domestic law as the effective legislation. **This practice is not unique to Ghana and is common among countries, which will often elect to follow national laws and regulations or domesticate regional regulations, even when they are self-executing, leading to differences in national legal systems and regional regulations.**

Source: Kuhlmann, Katrina and Yuan Zhou, 2016. Seed Policy Harmonization in ECOWAS: The Case of Ghana. *Syngenta Foundation for Sustainable Agriculture.*

stead, UEMOA intervenes in four other ways. First, it builds and rehabilitates markets near borders. The improved market infrastructure makes some marginal improvements, e.g., by facilitating (a) municipalities' collection of market tax and (b) traders' loading and unloading of animals using ramps. However, there is no evidence that these markets make cross-border trade more efficient. Second, UEMOA rehabilitates and re-equips abattoirs. These improvements are aimed at providing nationals with better-quality meat (ostensibly at affordable prices), rather than meeting the needs of the export market. Third, it supports national laboratories. Fourth, it works with ECOWAS to build a series of joint border posts to streamline cross-border trade (but that do not improve present SPS controls). Government services, principally customs, have generally refused to use these posts, which have proved to be expensive white elephants. Training and publicity do not feature prominently in these mostly infrastructural interventions. Thus, while harmonization of SPS regulations with ECOWAS moves slowly, UEMOA's related investments do not target core processes that might improve animal and plant health or food safety (other than through support to laboratories) or that might make regional trade more efficient.

TRADE AFRICA AND THE WEST AFRICAN TRADE HUB

Trade Africa is a partnership between the United States and sub-Saharan Africa to increase internal and regional trade with Africa, and expand trade and economic ties among Africa, the United States, and other global markets. Trade Africa currently has initiatives in Côte d'Ivoire, Ghana, and Senegal. The West African Trade Hub (WATH) is an implementing partner of Trade Africa and the Feed the Future program, and it helps the region's farmers and firms compete, attract investment, and boost trade.

Trade Africa and the WATH should continue playing a facilitative role in advancing the SPS agenda in West Africa. As the current report's findings illustrate, exports for these three value chains remain constricted internationally since West African countries have not been able to achieve the WTO standards at a volume and consistency to be competitive in such developed economies' markets. Many of these countries are not even producing sufficient quantities of these commodities to appease domestic consumption and to permit exports. As West African countries strive to attain international standards in the longer term, the short and medium-term focus for these commodities should be on stimulating and promoting internal and regional trade.

In the meantime, the WATH has already undertaken substantial activities in these three sectors. These include, but are not limited to, creating the first regional livestock fair in Abidjan (WATH 2016), hosting Regional Cereals Exchanges (WATH 2016), promoting trade of livestock during the Muslim festival of Tabaski from Sahelian countries to coastal markets (WATH 2016), and holding transporter compliance trainings in

Key Takeaways

- Principle of free movement of goods is inconsistently respected
- Frequent illegal collection of fees as products move across borders and as they move through other countries
- Although most ECOWAS states comply with the regional body's rules, there is little harmonization of those rules in the application and interpretation
- States may comply with the rules at the national level, but not all countries national parliaments have ratified them; this weakens their legal backing and enforcement
- Capacity to test, inspect, enforce is very low
- Stronger SPS regulatory capacity in Nigeria and Ghana than francophone nations in West Africa.
- Principal of 'mutual equivalence' beyond SPS into all trade documentation would be more easily achieved than harmonization.

Burkina Faso to ease livestock trade (WATH 2016). The team also learned that WATH was facilitating the direct sale of cattle between Malian producers and Abidjan supermarkets, which represents the first stage of the VC-shortening that this report proposes later in the priority investments section. WATH should continue to promote these activities in the region, and build upon them by establishing a traceability system and the development of feed markets to promote trade and advance the SPS agenda.

These activities run in parallel with the activities Trade Africa is employing in East Africa through the current Cooperation Agreement with the East African Community (EAC) to implement the WTO's Trade Facilitation Agreement. This effort seeks to curtail the documentation and formalities needed to stimulate trade in the region.

Trade Africa and the WATH should continue working to reduce trade barriers and can work with ECOWAS and UEMOA to limit and enforce SPS documentation (e.g., certificates of origin, animal, plant health) needed at checkpoints. Coordination with bilateral initiatives, especially in Ghana and Nigeria, is important because one of the major factors limiting the implementation of ECOWAS regulations is the requirement that national parliaments first ratify the regulations.

Trade Africa and the WATH can also stimulate commerce and address SPS issues by tackling a number of important areas, including:

- AI and Maize Lethal Necrosis (MLN) controls
- Public education on the cost of aflatoxin contamination
- Trader workshops to identify strategies to reduce miscommunication around, and identify solutions to control for product quality as it crosses borders
- Harmonization of seed policy to allow for free movement of seed once published in the ECOWAS registry
- Strengthening national SPS committees and subcommittees.

By brokering these partnerships, promoting knowledge sharing, and reducing barriers to trade among regional, national, and local actors, Trade Africa and the WATH can further advance the SPS agenda in the region.

5. VALUE CHAIN SNAPSHOTS

5.1 MAIZE

COMMODITY DESCRIPTION: VARIETIES, GRADES, AND STANDARDS

Introduced in the 1500s to West Africa, maize has since become Africa's dominant cereal crop. It accounts for over 25 percent of low-income household expenditures in West Africa. Maize grains are rich in vitamins A, C, and E, and are an abundant source of carbohydrates and essential minerals. On average, maize contains 9 percent protein, higher than cassava but lower than rice. Maize is also rich in dietary fiber.

In West Africa, most cultivated maize is either the white and yellow cultivars. White maize is preferred for human consumption and yellow maize for feed due to its higher level of beta-carotenes, which give egg yolks increased surface tension and an orange color, and give a deeper color to broiler breast meat.

Low productivity reduces opportunities for trade because it reduces the tradeable surplus, with the exception of shortages that require imports to fill the gap. Trade however continues to drive the SPS agenda because it is the act of importing that triggers concern for SPS issues by the buyer, which in turn obligates the exporter to comply with regulations. Low maize yields mean that there is little or nothing to export.

Table 2—Maize Yield (2014)

Country	Yield (Metric tons/ha.) (2014)
Nigeria	1.59
Ghana	1.73
Burkina Faso	1.23
Côte d'Ivoire	2.05 ²
Mali	1.55

Source - <http://data.worldbank.org/indicator/AG.YLD.CREL.KG>

Of the countries in this study, only Ghana and Burkina Faso currently produce a maize surplus; all others operate either a permanent or a seasonal deficit. Average maize yields in the countries studied range from 1.23 tons/ha. in Burkina Faso to 2.05 tons/ha in Côte d'Ivoire. In comparison, 2014 global maize yields were 3.89 tons/ha. Raising maize yields to more globally competitive levels is key to raising the importance of SPS issues in maize in general and for aflatoxin, pesticide residues, and rodent waste in particular. Unfortunately, countries included in this study have been far more successful at developing adapted maize varieties than in facilitating farmer access through functioning maize markets.

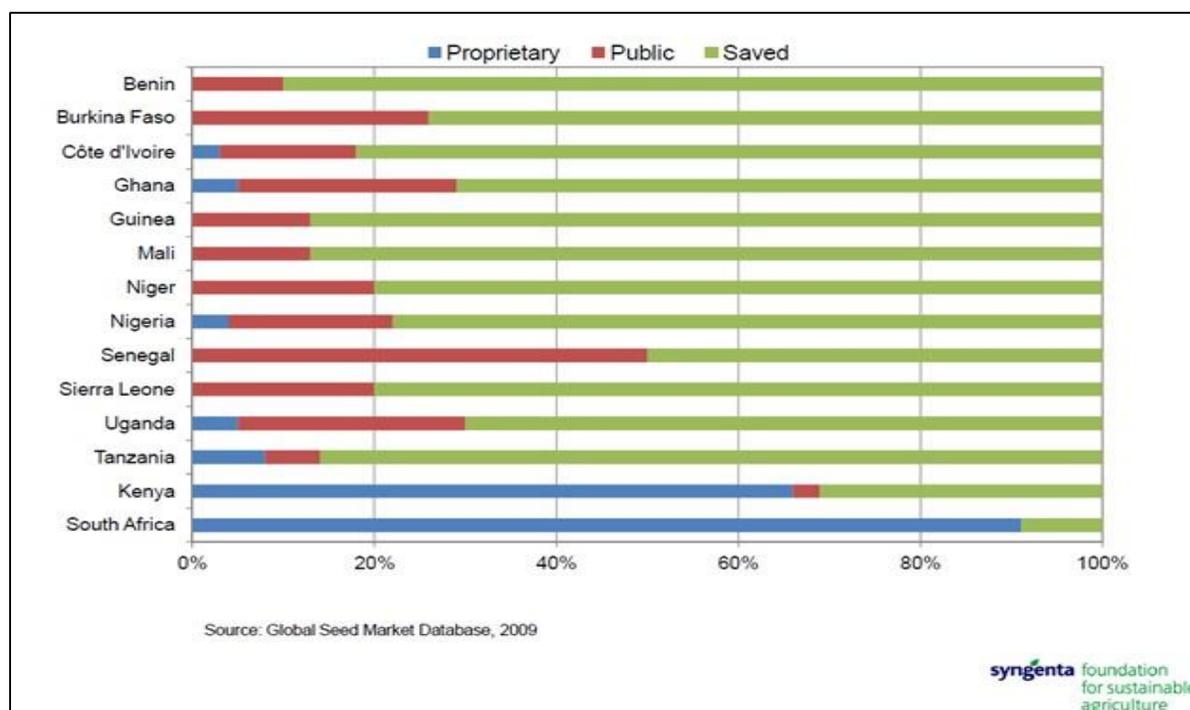
SEED

National research bodies in collaboration with IITA scientists have developed high-yielding and disease-resistant maize varieties that are adaptable to the region's various agro-ecological zones. Striga-resistant varieties suppress the weed, and scientists have released other pest-resistant varieties into endemic areas of Nigeria and Cameroon. Recently, IITA started research to enhance the nutrient content of maize to combat malnutrition and diseases caused by micronutrient deficiency. They are also developing mycotoxin-resistant varieties in collaboration with specialized laboratories to minimize the health hazards of these toxins.

² FAOSTAT, October 4, 2015

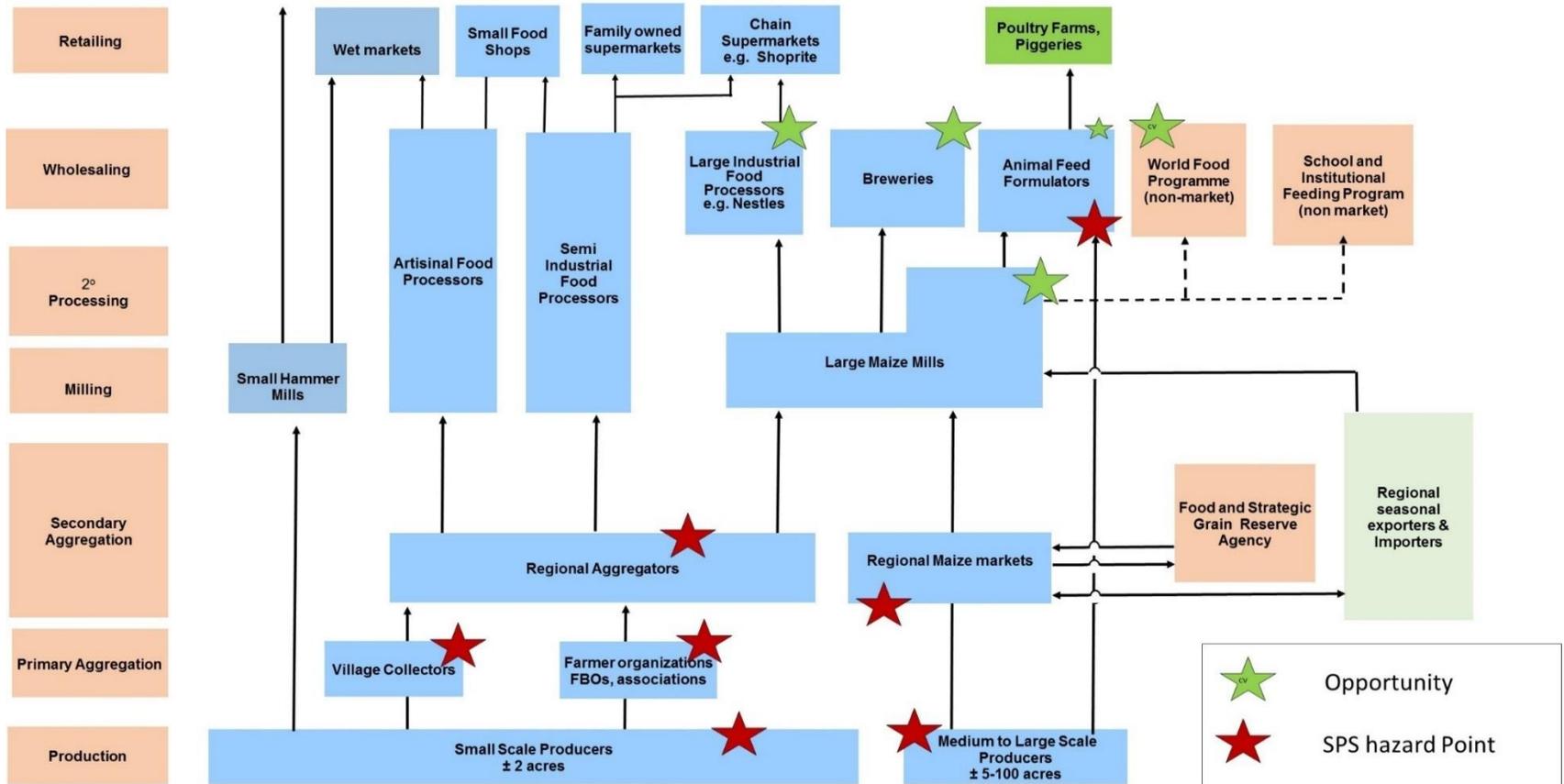
Low yields are a political and a market failure—and the farmer pays the price. Public institutions that have been reasonably successful at developing productive and adapted maize varieties dominate the maize seed sector. These same institutions have been largely unsuccessful at developing commercial markets for the adapted seeds. While the actual structure of national seed markets varies by country, all four countries have developed locally adapted maize varieties, but have been less successful at creating private marketing channels for quality seed. The limited private-sector participation in most regional seed markets tends to be seed multipliers, selected by government to multiply foundation seed and to create certified seed, which they sell back to the government and to farmers, either through regional agricultural ministry offices or to private retailers. Most of these seed multipliers are small-scale and lack the cold chain necessary to protect germination rates. The chart below illustrates both the low level of private proprietary seed available and the weak penetration of public domain seed, with the exception of Burkina Faso and Ghana. Until national governments facilitate the development of commercial seed markets, whether for nationally developed or imported seed, small-holder farmers will continue to suffer.

Figure 3 - Proprietary vs. Public Seed in Africa



Governments must develop mechanisms to license the right to multiply and market the genetic material of public hybrids to private seed companies. The team only found this in Burkina Faso and Nigeria, where several seed companies obtained the exclusive rights to multiply and market government or IITA/CIMMYT-developed varieties. The largest of these, Premier Seed, produces foundation and certified seed and markets six domestically developed hybrids, three yellow and three white, each with production capacity exceeding six tons/ha. Premier Seed is also conducting field trials and tests of maize varieties for Pioneer/DuPont, Syngenta, and Monsanto. If these varieties earn approval, Premier will likely become their distributor. ECOWAS rules allow for movement and marketing of seed certified and commercially released in one country to other member states. Only Nigeria and the UEMOA members officially allow for the free movement of seed within the region, yet in practice customs in intermediate countries often still demand large bribes to traverse their territory.

Figure 4 —Maize Value Chain Map



In the value chain map in Figure 4 above, the research team identified a number of hazard points and opportunities for private sector investment to increase trade compliance with SPS rules and regulations. The green arrow below explains that the value chain flows down, with the upstream actors being the producers to the downstream ones being the buyers.

Table 3—Explanation of Hazard Points and Opportunities—Maize



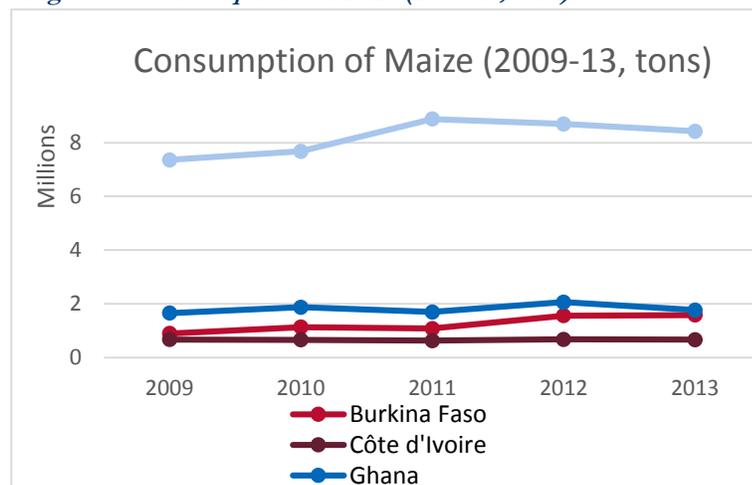
Value Chain Actor	SPS Hazard Point
Smallholder farmers	Soil and storage aflatoxin contamination, counterfeit pesticides, improper use and/or disposal of pesticides
Medium- to large-scale producers	Same as above, though should be better able to manage
Village collectors	Aflatoxin from storage, improper use of storage fungicides
Farmer associations	Aflatoxin from storage, improper use of storage fungicides
Regional maize markets	Aflatoxin from storage, improper use of storage fungicides
Artisanal food processors	Aflatoxin from storage, heavy metal transfer from cooking instruments
Feed mills	Passing aflatoxin- and pesticide-contaminated maize to fed animals
Semi-industrial food processors	Passing aflatoxin and pesticide residues to consumers
Large-scale maize mills	--
Large industrial food processors, e.g., Nestlé	--
Breweries	--

Table 4—Explanation of Variation in Maize Value Chain by Country

Item	Nigeria	Côte d'Ivoire	Burkina Faso	Ghana
Seed law	✓	✓	✓	✓
Seed law harmonized with ECOWAS/CÉDEAO framework	✓			
Commercially available public sector hybrids	✓		✓ ³	✓ ⁴
Imported hybrids commercially available				
Maize grades				✓
Maize Industry Association (advocacy and education)	✓			✓
Private-public partnership in publicizing and monitoring SPS standards				✓
Warehouse receipting/warrantage systems	✓	✓	✓	✓
Public buffer stock or strategic grain reserve body	✓			✓

DEMAND FACTORS

Figure 5 - Consumption of Maize (2009–13, tons)



Key Takeaways

- Maize yields are essentially static despite rising demand
- Population and income growth will outstrip productivity gains without major technological change
- Poultry feed demand is the fastest growing segment and comprises as much as 40 percent of total demand

³ Though commercially available, only in small quantities and sold through public sector (Ministry of Food and Agriculture) outlets

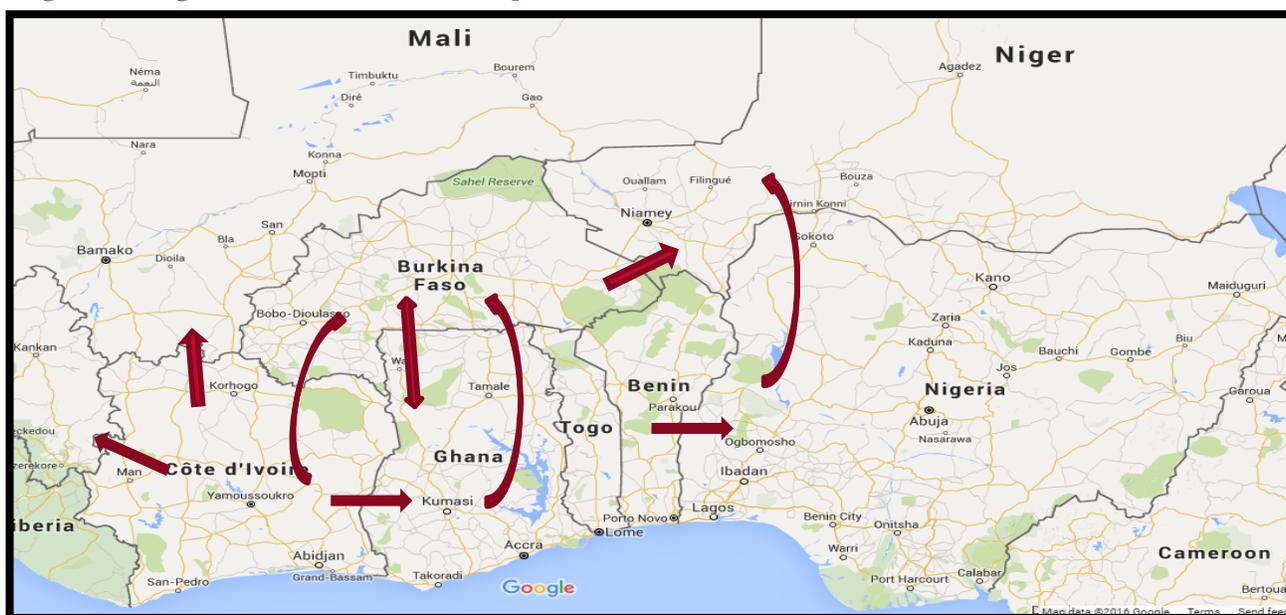
⁴ Though commercially available, only in small quantities and sold through public sector (Ministry of Food and Agriculture) outlets

REGIONAL MAIZE FLOWS

Côte d'Ivoire, Nigeria, Ghana, Burkina Faso, Mali, Benin, and Togo are the main seasonal exporting countries in the region. Exports go to Niger, Burkina Faso, and Senegal. Niger is the highest importer of maize. Nigeria, Côte d'Ivoire, Benin, and Ghana are the largest exporters of maize in the subregion.

Côte d'Ivoire produces a lot of yellow maize in the northern part of the country and exports it to neighboring countries in the Sahelian region. In October 2013, Côte d'Ivoire exported 1,694 tons of maize to Burkina Faso, Mali, and Senegal, while Nigeria exported 2,120 tons of white maize to Niger. Ghana and Benin also exported 699 and 740 tons of white maize to Burkina Faso and Niger respectively. Burkina Faso, on the other hand, exported 872 tons of white maize to Niger but at the same time imported 1,515 tons of both white and yellow maize from Ghana, Benin, Togo, and Côte d'Ivoire.

Figure 6 —Regional Maize Trade Flows Map



ISSUES AT DIFFERENT CORRIDOR BORDERS

Most of the maize and livestock that crosses borders does so in large trucks that carry 30–35 tons of cargo and frequently overloaded to as much as 50 tons. Small-scale producers grow and harvest the staples, and traders collect and transport the bulk over greater distances to regional markets. The low value-to-bulk ratio and the multiple steps involved mean that transport costs can significantly increase staple food prices. The cost of moving goods in sub-Saharan Africa is high, transit times uncertain, and delays exceptionally long. Studies have estimated that the cost is between US\$0.04–0.10 per km/ton for long-distance road transport

and US\$0.10-0.40 per km/ton for shorter-distance transport⁵. This is much higher than road transport in OECD countries, where the estimated costs are US\$0.03.⁶

Burkina Faso and Ghana

Maize enters Ghana from Burkina Faso and Togo. The greatest volume of imports cross the corridor from Dakola (Burkina Faso) to Paga (Ghana). Burkina Faso only levies taxes on freight loads over 10 tons. As a result, the consultant team observed large Burkinabé-licensed trucks unloading in Dakola onto moto rickshaws and bicycles, which carried maize across to Paga where it was loaded onto other large trucks with Ghanaian license plates. The lorry drivers in Dakola indicated that the off-loading and reloading charge at the border is less than the fees they would have to pay on both sides of the border. Additionally, the Ghana registered vehicles face fewer road stops once in Ghana, just as the Burkinabé trucks face fewer stops in Burkina Faso.

Côte d'Ivoire and Ghana

Maize entering Ghana from Côte d'Ivoire arrives at the Techiman maize market, where it is inspected, weighed, and depending on the moisture level, dried by one of Techiman's private drying facilities. When the consultant team visited the Techiman market, no dryers were operational. When a maize shipment arrives from Côte d'Ivoire, representatives of the Techiman Maize Traders' Association verify and register the Ivorian phytosanitary certificate and certificate of origin. Both Côte d'Ivoire and Ghana export maize within West Africa. They also buy and sell to each other depending on local market price differentials. In April 2016, the Techiman market reported 600 tons of maize entering from Côte d'Ivoire.

Burkina Faso and Côte d'Ivoire

Commercial maize flows from Burkina Faso to Côte d'Ivoire peak in December and January, after the Burkinabé harvest. During this period, up to ten 40-ton trucks pass daily through Niangoloko (Burkina Faso) and Ouangolodougou (Côte d'Ivoire) border posts. The Niangoloko-Ouangolodougou crossing is the most important land border between the two countries. Commercial maize flows from Côte d'Ivoire to Burkina Faso peak in July and August.

When a shipment of maize arrives in Ouangolodougou from Burkina Faso, the Ivorian phytosanitary agent reviews the accompanying paperwork, including a Burkinabé certificate of origin but not a Burkinabé phytosanitary certificate, and inspects the shipment itself. Then the agent issues an Ivorian inspection certificate and returns the certificate of origin to the freight forwarder or trader. The agent explained that, as Burkina Faso sometimes bans cereal exports, it is not always possible for a Burkinabé exporter to obtain a phytosanitary certificate. It seems that during periods of export bans, Ivorian phytosanitary agents grew accustomed to the absence of phytosanitary certificates. When they felt they needed some certification, they began accepting certificates of origin without concern for the stipulations of the ECOWAS SPS regulation. Phytosanitary staff explained that most agricultural goods crossing the border are unprocessed so they do not issue phytosanitary certificates unless requested. This explanation is probably an attempt to rationalize the status quo. However, current protocol contradicts the ECOWAS SPS regulation, which states that, without exception, unprocessed agricultural commodities require phytosanitary certificates. The inspection charge is 5,000 FCFA for 40-ton trucks and 2,000–4,000 FCFA for smaller trucks. Perhaps unsurprisingly, the limited inspection carried out

⁵ Regulatory barriers to trade undermine Africa's potential in regional food trade, in *Africa Can Feed Africa* part 2 pdf.

⁶ See Jordan Schwartz's blog on 'Food Prices: Eating the Cost of Logistics' at <http://blogs.worldbank.org/latinamerica/food-prices-eating-the-cost-of-logistics>.

reveals few problems with the quality of cereals imported into Côte d'Ivoire, though sometimes the agents find weevils. The agent did not mention aflatoxins.

Over the course of a year, maize and maize products, such as animal feed and flour, flow in both directions across the border. Recent annual figures recorded by the Ivoirian phytosanitary service are 3,630 mt imported and 640 mt exported, but records are incomplete; these figures are probably severe underestimates. Some traders do not declare their shipments to the phytosanitary service, others follow routes where no phytosanitary controls take place, and still others ship their maize in motorized freight tricycles that carry about two tons because government services do not try to control such small amounts. The Ivoirian phytosanitary agents have small, basic offices at the border that lack equipment such as inspection tables, probes (for taking samples from sacks), sieves, and magnifying glasses. Agents have no means of transport to make inspections at locations away from their offices. They have difficult relations with the customs officers, who limit their contact with passing trucks. They are aware that UEMOA proposes to construct a joint Burkinabé-Ivoirian border post at Larelaba. The basic principle behind the proposal is that staff of each agency on both sides of the border will work together to process shipments in each direction, improving efficiency by eliminating the need for two successive checks.

Key Takeaways

Ivoirian phytosanitary agents accept Burkinabé certificates of origin from traders shipping maize to Côte d'Ivoire and do not expect a Burkinabé phytosanitary certificate to accompany the shipment. This contradicts the ECOWAS SPS regulation, which requires phytosanitary certificates for each cross-border shipment of an unprocessed agricultural commodity but specifies a certificate of origin only for certain processed commodities. At the border, traders use various methods to avoid submitting their maize shipments for phytosanitary inspection, leading to biosecurity risks and downwardly biased statistics.

Phytosanitary agents are severely under-equipped and cannot perform a professional inspection of maize imports. They have no direct links to the national agricultural laboratory, LANADA, for tests that might detect pathogens. They have difficult relations with the customs officers, who restrict their work. They lack technical retraining and basic details of the regional SPS protocol. Their hope that joint border posts will solve their problems is unfounded.

5.2 LIVESTOCK (CATTLE, SHEEP, & GOATS)

COMMODITY DESCRIPTION: CATTLE

There are two broad subspecies of cattle in West Africa: zebu and taurine (humpless). All told, they number more than 60 million heads. Cattle production takes place in free-range, traditional, arid-zone pastoral systems that use few purchased feed or veterinary inputs. It also takes place in sedentary, compound-based systems in higher-rainfall areas, with variable use of purchased inputs. Animals gain weight during the second half of the calendar year, when pasture is richer and more available, and then lose weight during the first half of the year. Supplementary feeding during the first half of the year reduces weight loss, and thus morbidity and mortality. Peri-urban cattle breeders invest in crossing West African breeds with exotic breeds to improve productivity, but at the cost of less robustness in the face of severe climatic conditions. Drought may dramatically increase mortality, particularly in traditional systems that do not have easy access to supplementary feed.

Cattle play an important food-security role. Beef serves as a source of protein and iron for West Africans whose diets mostly include grains and starches. A significant proportion of the rural population derives its livelihood from the cattle value-chain, and growth in the sector could lead to their improved economic situation.

West Africans use cattle for beef, offal, milk, transport, traction, hides, and other by-products. Premium cuts of meat are of inconsistent quality. West African beef lacks the consistent high quality of countries such as South Africa. In the absence of traceability systems, feedback along the value-chain from consumer to producer is rudimentary. Therefore, upstream veterinarians do not target foci of disease in a way that efficiently improves the market value of cattle. Trade cattle flow from the Sahelian countries of Burkina Faso, Niger, and Mali to the coastal countries of Ghana, Nigeria, Benin, Togo, Senegal, and Côte d'Ivoire.

Value-added through fattening has become an important economic activity before Sahelian countries export animals. Feedlots are dependent on the seasonal availability of inputs and vary in sophistication. More systematic and efficient use of feedlots and fattening stations would lead to improved productivity.

COMMODITY DESCRIPTION: SHEEP & GOAT

Four breeds of sheep are common to West Africa: balami, uda, yankasa, and West African dwarf (WAD). The last is the most common in production. There are three varieties of goats common to West Africa: West African long-legged, Sokoto red, and West African dwarf.

West Africans use small ruminants for meat, offal, milk (goats), skins, and hair. West Africans consume rams primarily during the Muslim holidays, while families serve goats periodically for ceremonies (births, deaths, marriages, and festivals throughout the year), though bucks may substitute for rams during Muslim holidays. Fattening of adult sheep (but usually not goats) occurs before these holidays and ceremonies.

Photo 1—Livestock market in Achaiman, Ghana

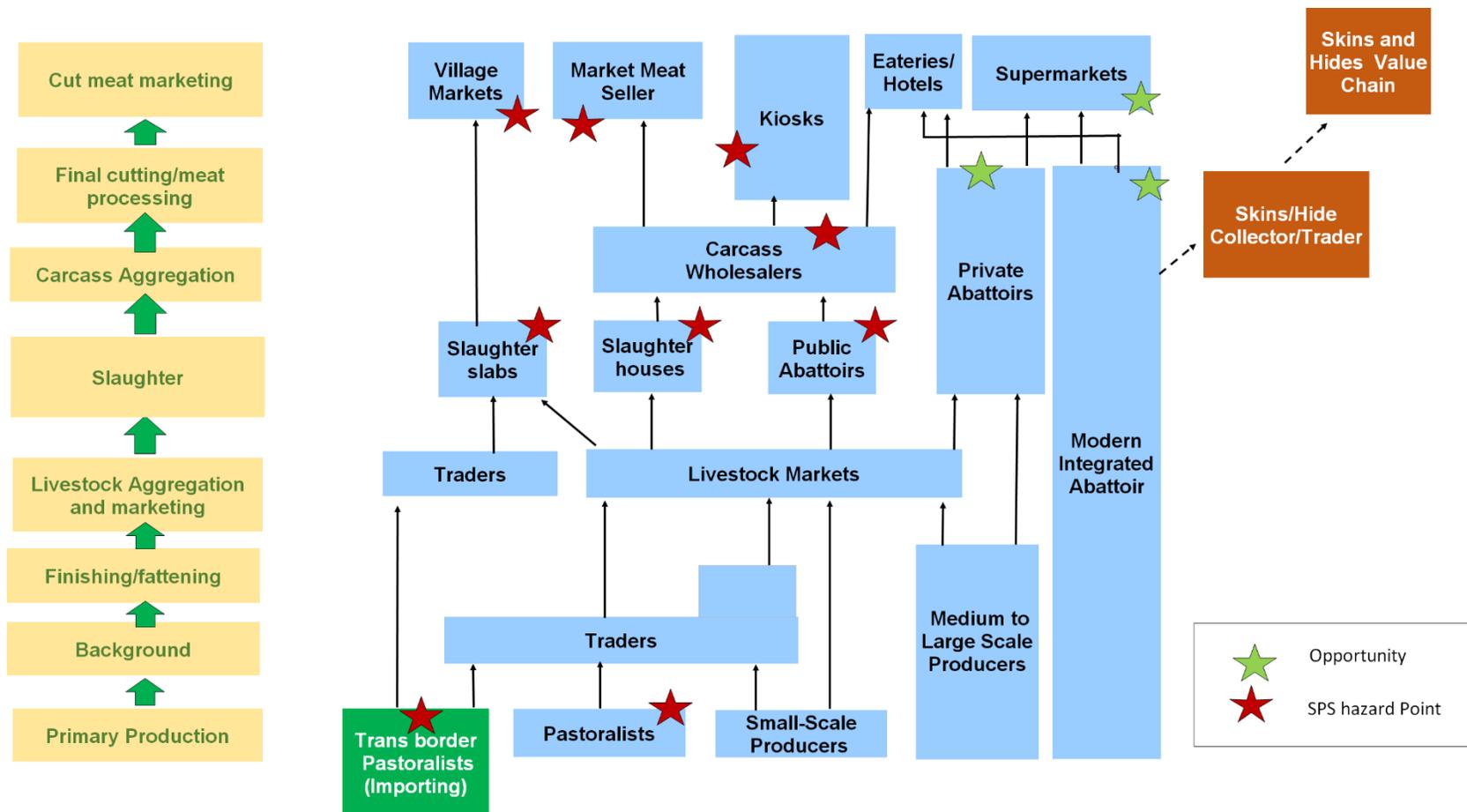


Traditional small-ruminant producers do not generally see production as a profit-making business, but rather see production as a savings account that they can draw down when needed. Many small-ruminant producers are women, who rarely rear cattle.

Pastoral small-ruminant production systems involve significant trekking between water and grazing (sheep) or browse (goats), particularly in the hot dry season when natural feed is scarce. Herds return to the pastoral encampment at night. Sedentary production occurs in a family compound where sheep/goats spend the night and may receive supplementary feed. During the day, a shepherd takes the village herd to nearby grazing, or animals may range freely if there are no predators or fields of crops.

Demand for small ruminants' meat is strong in the region, and potentially in external states. For example, interviews conducted during the research indicated Gulf States and countries such as Mauritius have expressed interest in purchasing sheep and goats from Nigeria.

Figure 7 – Value Chain Map: Cattle, Sheep, & Goat



RUMINANT DISEASE

Development of pathologies in ruminants takes place almost entirely during their rearing. This period, typically two to three years for sheep and five to six years for cattle, largely exceeds the fattening and marketing periods.

During rearing, ruminants may develop disease and parasites, some of which are transmissible to humans (“zoonoses”). Examples of zoonoses include anthrax, brucellosis, and tuberculosis (TB), all of which can affect public health. Those hospitalized with TB and brucellosis in West Africa are generally herders who spend much of their lives with cattle. TB can spread from cattle to humans via aerosol inhalation, but more commonly passes through consumption of raw milk from infected cattle, like brucellosis. Bovine tuberculosis is an occupational hazard for abattoir workers.

In Abidjan, TB is the disease most commonly revealed during inspection of cattle carcasses at the abattoir, though prevalence fell over the past five years. This reduction suggests better animal health in Mali, Burkina Faso, and other Sahelian countries, the sources of most of these cattle. In contrast to carcass inspection, visual inspection of the corresponding animals does not generally give signs that allow diagnosis of TB. Thus, many tubercular animals form part of herds certified as healthy for export. Depending on the development of the disease, an abattoir may condemn the lungs or the entire carcass of an infected animal. However, even if tuberculosis escapes detection, well-cooked meat is safe to eat.

If not operated hygienically, the abattoir or slaughter slab can generate disease. Hygienic slaughter and meat handling require workers to keep the carcass separate from contaminated surfaces, particularly the abattoir floor, using hooks and racks. Carcasses should hang far enough apart to avoid an unskinned carcass contaminating an adjacent skinned one. Careful evisceration avoids the spread of intestinal content onto the meat’s surface. A sealed indoor space eliminates insects, birds, and rodents. Cleanable surfaces and water hoses allow frequent thorough washing. An incinerator should be available for prompt disposal of condemned animal parts. Meat should enter the cold chain quickly if it will be sold frozen or chilled. Prolonged storage at ambient temperature will boost bacterial spoilage and favor the development of micro-organisms such as salmonella or E. coli, which can create public-health crises. The vast majority of West African slaughter takes place in conditions that do not respect most of the above criteria. This is partly due to traditional butchers’ influence over the operation of abattoirs and slaughter slabs.

Other diseases and parasites are important because they are transmissible within, or less frequently, between ruminant species. They can increase animal morbidity, thus reducing weight gain and reproductive efficiency, and mortality. Mortality causes a sudden loss; morbidity reduces yield over time. Together, mortality and morbidity cause a significant drop in the profitability of ruminant production. Some diseases are endemic (permanently present) while others are epidemic (breaking out from time to time, potentially on a large scale).

Diseased animals may enter coastal West African countries in transhumant herds, as well as in trucked commercial herds. As transhumant herds may linger and return annually, these animals play a larger role in regional disease transmission. Between these two extremes are trade herds that trek through Côte d’Ivoire from January to April to take advantage of available pasture before slaughter.

The inability of the West African ruminant value-chain to detect and eliminate the disease burden that animals carry leads other countries that have eliminated these diseases to ban livestock imports from the region. Traders that want to export beef or mutton must generally satisfy the importer that few animals entering the

abattoir are diseased—veterinary officers can detect diseased animals and eliminate them from the value-chain—and slaughter and meat-processing procedures meet hygienic norms.

Table 5—Explanation of Hazard Points and Opportunities—Livestock

The green arrow below illustrates the direction of the value chain, from the upstream actors (producers) to the downstream ones (buyers).



Value Chain Actor	SPS Hazard Point
Transborder and national pastoralists	Mixing of herds that are diseased and insufficiently vaccinated; lack of veterinary care
Medium- and large-scale producers	Greater concentration of animals can lead to easier and greater transmission of disease
Private abattoirs	Insalubrious abattoir conditions and poor hygienic practices, but less than above
Modern integrated abattoirs	Some degree of above, but less
Carcass wholesalers	Carcasses are not systematically stored in chillers, but sent directly to meat shops with unsanitary conditions
Village markets/market meat sellers/kiosks	Meat not well protected against contamination by flies; kiosks lack constant power source and proper cold-chain facilities
Supermarkets	Varying levels of hygienic practices by handlers of meat, but better if compared to village and traditional retailers

Table 6—Variation by Country—Livestock

Item	Nigeria	Côte d'Ivoire	Burkina Faso	Ghana
National Veterinary Law	✓	✓	✓	✓
Implementation of a harmonized national veterinary law within the ECOWAS framework	✓	✓	✓	✓
Imports majority of its red meat consumption	✓	✓	-	✓
Cattle, sheep, and goat associations (advocacy and education). This includes small producers and pastoralists.	✓	✓	✓	✓
Presence of modern integrated abattoirs	✓	✓	-	✓
Private-public partnerships set up with abattoirs	✓	✓	✓	✓

TRADE CORRIDORS

Trucking

Cattle are loaded onto single or double-decker trucks, and number about 30–35 mature fattened cattle per 40-ton truck. On double-decker trucks, the cattle must sit for the duration of the trip except during border inspection. Hay/grass/soil line the trucks to prevent cattle from slipping during the trip and to absorb the animals' urine and feces. Trips can last two to three days before animals arrive at the destination market. Livestock traders do not feed the animals and only provide water during the trip. A handful of young men accompany the shipment to help up animals that fall down in order to prevent them being trampled.

Border process—cattle and small ruminants

Upon arrival at the border, livestock traders may or may not offload the animals. Traders offloaded animals arriving into Ghana from Burkina Faso at Paga, but this was not evident in Côte d'Ivoire. Veterinary officers inspect imported animals and should have the capacity to quarantine suspicious animals. However, no quarantine lots exist at the Ivorian border. Vets should perform physical and eye-test examinations, but this is not the case for animals entering Côte d'Ivoire. Animals often arrive stressed and sickly, having lost significant weight. Importers are required to obtain a movement permit and veterinary certificates. These certificates should be free in ECOWAS countries, but importers must pay for them at each border. Livestock traders should not need certificates of origin for animals imported into ECOWAS countries, but most ECOWAS countries' veterinary officers require them.

Information/transparency

No sophisticated electronic surveillance system exists in these four countries, nor throughout West Africa, to document flows of animals or to transmit timely information on diseases. Border officials still record information on animals on large paper ledgers, and there is no system to standardize this information across countries. Nigeria's president provided preliminary approval of computerization at all port entrances and borders posts, with all activities of the relevant agencies captured. This system will help to eliminate delays and corruption at checkpoints and border posts, and will enhance free trade (Nigerian government 2016). Burkina Faso has a similar system in place, however both fall short of a regional electronic surveillance system that would follow animal shipments and track animal disease in space and time.

Commercial networks

Long-standing commercial networks exist between sales brokers in coastal countries and exporters from the Sahelian nations. Social-cultural-linguistic factors form the basis for these established relationships.

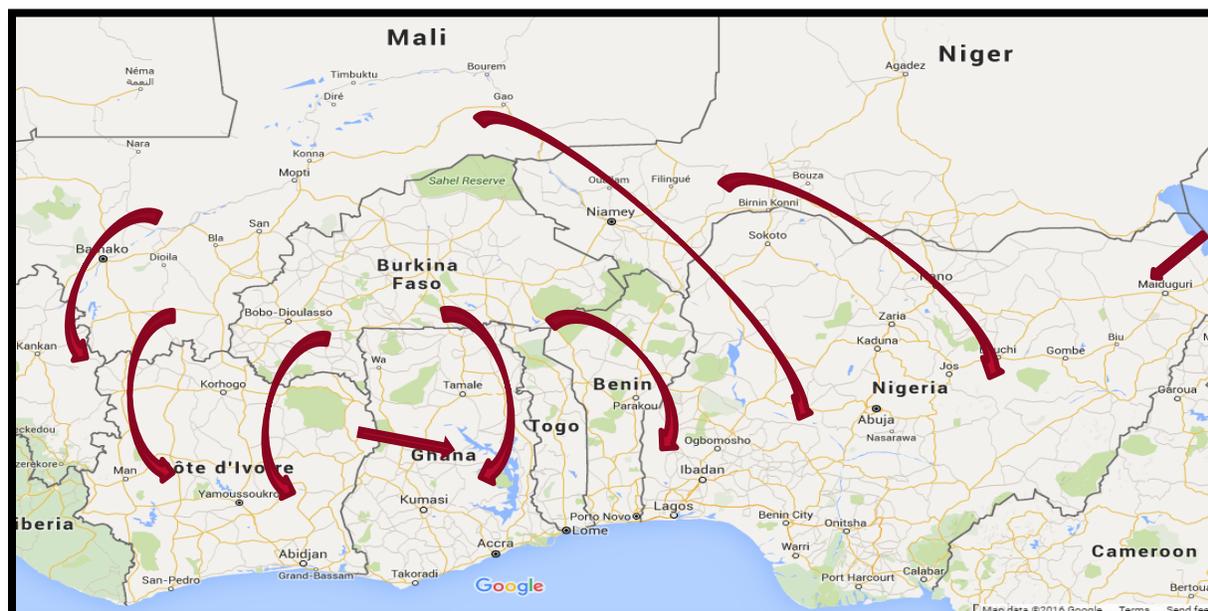
Corruption

Police and security officials extract bribes at numerous checkpoints, largely independently of the validity of traders' documents. Traders pay these bribes to reduce delays, minimize dehydration and deterioration of the animals' health, and attempt to maximize profits.

Language and currency

The language barrier and administrative differences between Francophone and Anglophone countries inhibit trade. Traders do not like the uncertainty of exchange-rate fluctuations when they change currency between UEMOA countries and non-UEMOA countries (e.g., Ghana and Nigeria).

Figure 8 —Livestock Trade Flow Map



Key Takeaway

- Cattle, sheep, and goat production occurs mostly in Sahelian countries, with major export flows to the coastal countries

ISSUES AT DIFFERENT CORRIDOR BORDERS

Burkina Faso and Ghana

Burkinabé and Ghanaian livestock traders truck animals to the border between the two countries, avoiding certain routes that are unsafe due to the state of the roads and the high incidence of armed robbery. Upon arrival at the border, animals are already weak, stressed, and sickly depending on the length and conditions of the journey. After processing on the Burkinabé side of the borders, Ghana's Veterinary Service Directorate (VSD) officers offload, count, inspect the animals, and steer them to quarantine lots for a few hours. Before the eradication of rinderpest in 1996, VSD quarantined cattle for nine days, and sheep and goats for 24 hours. Currently, offloaded animals take a short rest, drink water, and graze on nearby pastures before they continue the journey.

Photo 2 - Workers about to load cattle at Paga (Ghana-Burkina Faso border)



For animals brought for breeding purposes arriving at Paga (Ghana), officials send blood samples to the Pong Tamale Central laboratory for diagnosis of brucellosis, contagious bovine pleuropneumonia (CBPP), and bovine tuberculosis. Normally laboratory results take up to seven days, depending on the lab's workload, but often less. Even if less than seven days, however, this potential delay is a disincentive for traders to tolerate official biosecurity measures. Furthermore, traders use threats of violence and harassment to pressure sanitary agents not to condemn diseased animals. These traders risk significant losses of income from condemnation.

Once livestock traders enter Ghana from Burkina Faso, they are also technically required to present an International Veterinary Certificate and an import permit (a.k.a. movement permit) to Ghanaian authorities. Movement permits issued at the border cost five Ghanaian cedis (GHC)/head of cattle and two GHC/sheep and goat. Traders may lie about the number of animals they have to avoid paying these fees.

Upon visiting quarantine facilities on both sides of the Paga-Dakola border, it was evident that the Paga (Ghanaian) facility is better-resourced, with the presence of actual holding pens for offloaded animals and areas for cattle and small ruminants to graze. However, across the border in Dakola, Burkina Faso, few quarantine facilities exist, and Burkinabé veterinary service agents do not appear to be conducting adequate inspections. This makes sense since Burkina Faso is a net exporter of livestock, and is therefore less likely to invest in increasing barriers (tariffs or non-tariff) to the livestock trade, which is a significant economic sector for them. The less effective controls in the detection and quarantine of animals heading south is an SPS risk.

In addition to uneven enforcement of SPS measures between the two countries, the Ghanaian-Burkinabé border is porous, with large amounts of informal trade. Traders may utilize these routes to evade inspections, limiting the effectiveness of animal health monitoring efforts. A significant volume of livestock imported into Ghana results from transhumant pastoralism. Pastoralists do not generally cross at official borders, but instead herd their animals wherever grazing land is available. This opportunism contributes to the challenge of inspecting all the livestock imported into Ghana. This cross-border flow can also transmit disease from

Ghana to Burkina Faso. North-South trade flows of animals across the border are seasonal, peaking during major religious holidays (e.g., Christmas, Easter, and Ramadan).

Some constraints faced by the VSD are:

- Lack of staff, with three veterinary officers monitoring two districts in Paga and Navrongo, instead of one
- Officers lacking proper biosecurity clothing
- Inability to provide veterinary drugs at affordable prices
- Untrained community animal-health workers, who are prone to inject animals without proper diagnosis, potentially creating more public health problems
- Reliance on natural medicines of dubious effectiveness, which are considered more affordable by producers and traders
- VSD's inability to inspect hides/skins for anthrax
- A lack of motorbikes for VSD agents to monitor the border effectively

Ghanaian traders estimated that they pay 2,200 GHC/truck in bribes (approximately US\$566) to import cattle from Burkina Faso to Ghana. Traders may haggle with uniformed officers at checkpoints and eventually pay a lower bribe, but in most cases, the reduced bribe paid falls short of the cost associated with an extra delay.

Burkina Faso and Côte d'Ivoire

Livestock imported into Côte d'Ivoire from Burkina Faso by truck or train receives a visual inspection and verification that the herd corresponds by species and number to the sanitary certificate issued in Burkina Faso. The whole process takes 15–30 minutes. Inspectors rarely deny entry to animals because there are no longer quarantine facilities to confine those suspected of disease. The only exceptions are animals that arrive dead in the truck. Inspection costs are 10,000 FCFA for a truckload of cattle and 45,000 FCFA for a truck or train wagon of small ruminants. For these fees, Burkinabé exporters receive an Ivorian *laissez-passer sanitaire*, which replaces the Burkinabé sanitary certificate but does nothing to reduce Côte d'Ivoire's bio-sanitary risk. The process is identical for animals arriving from Mali.

Photo 3: Burkina Faso International Veterinary Certificate



Photo 4: Ivorian laissez-passer sanitaire for cattle from Mali



Ivoirian veterinary agents lack equipment for clinical examination (e.g., stethoscopes and thermometers) and sampling (e.g., sample tubes, refrigerators, or iceboxes). Even if the agents had this equipment, they have no formal link to the nearest branch of LANADA, the National Agricultural Laboratory. They do not receive training to upgrade their skills systematically, and they have no means of motorized transport.

Niger to Nigeria

Significant flows of cattle, sheep, and goats from Niger traverse Nigeria's northern border and find their way to Nigerian live-animal markets. Transhumant pastoralists import most of these animals. Significant numbers enter illegally, evading inspection by the Nigerian Agriculture Quarantine Services (NAQS) at official land-border control posts.

Inspection of animals imported into Nigeria occurs at three different levels, depending on the destination region of the imported livestock:

1. International border post—manned by NAQS
2. Interstate post—located on borders between Nigeria's 36 states and staffed by officials from the State Veterinary Services. Most states have a control post for inspection.
3. Intra-state post—located along major routes linking the northern part of Nigeria to the southern part. NAQS staffs these posts.

For example, animals leaving Niger through Birni N'Konni and entering Nigeria via Illiea, en route to Lagos, will pass through one international border post, at least three interstate border posts, and one intra-state border post. Officials at each control post should inspect the animals. In addition to animals originating in Niger, livestock from Mali and Burkina Faso may enter Nigeria at the Illiea border post.

Formally, animals imported across Nigeria's northern border should have received an Animal Health Certificate from a vet in their home country. The owner should also have obtained an import license from the Federal Ministry of Agriculture and Rural Development (FMARD). At the border control post, NAQS will inspect the documents (import permit, certificate of health, etc.) and examine the animal to confirm its health before allowing it into the country. This NAQS inspection incurs no fee. Inspectors take samples from animals suspected of disease for NAQS laboratory testing. The trader pays for the test, and if necessary, for quarantine and treatment. NAQS allows animals found to be in good health to enter Nigeria.

The shipment of animals should attract no further fees at interstate and intrastate posts, but police and security officials will often delay movements to extract bribes. Individual amounts are small, but the cumulative cost is significant from a cost and time perspective.

These border posts face some major constraints in enforcing trade and SPS measures, including:

- Lack of sufficient facilities and equipment such as vehicles to monitor animal flows
- Lack of SPS documentation from exporting countries to import animals into Nigeria
- Nonexistent marking or tagging of animals to enable tracing

Ghana, Togo, Benin to Nigeria

The importation process from the Niger-Nigeria border also applies to livestock imported from Ghana, Togo, or Benin. Animals cross the Benin-Nigeria border, which runs north from the Gulf of Guinea, mostly destined for the populous southwest of Nigeria. West Africa's main coastal highway crosses this border at

Seme. Livestock forms a small proportion of trade flows at border crossings and no statistics exist for trade-ruminant flows here.

PRODUCTION, PRODUCTIVITY, MORTALITY

Production in West Africa

The arid Sahelian and semi-arid Sudanian ecosystems are relatively disease-free, making them good environments for ruminant production. Most rearing of cattle, sheep, and goats takes place extensively on the open range and, outside the cropping season, in agricultural areas. Herders move their animals to balance the availability of fodder and water. For instance, about 70 percent of Burkinabé rearing is transhumant, often crossing national boundaries.

Herders sell animals as they approach optimal sales age to meet cash needs, but they rarely fatten them for the market. They forsake increased revenues from fattening, largely because agriculture forms a relatively small part of their production.

Alternatively, specialists buy the animals for feedlot fattening over several months. They use agro-industrial byproducts, sometimes fodder crops, with veterinary inputs. On a smaller scale, individual families may also fatten some of their animals during the dry season.

Factors that Affect Productivity

Genes: Producers select West African animals for robustness as well as productivity, with a trade-off between the two attributes. Commercially oriented peri-urban producers may build herds of West African stock crossed with exotic animals to increase productivity, at the cost of some loss of robustness.

Figure 9—Annual Number of Burkinabé Cattle Herds with Disease (2005–13)

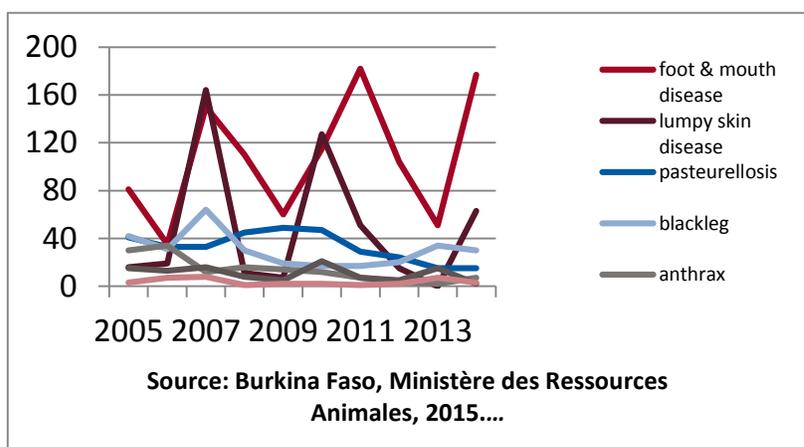
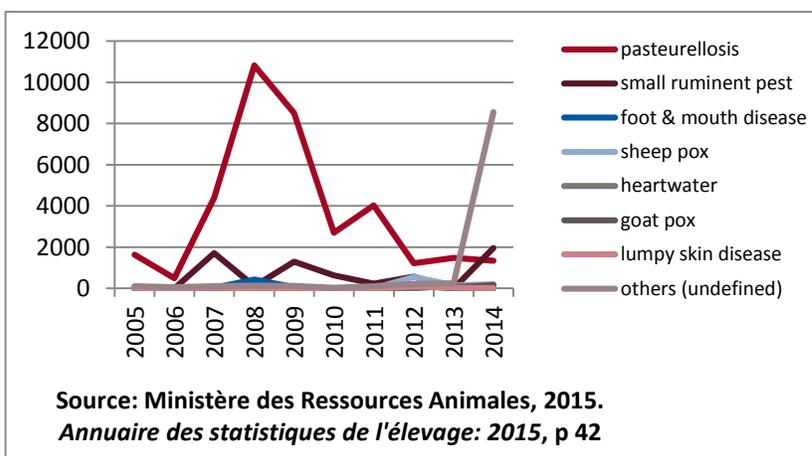


Figure 10—Annual Number of Burkinabé Small-ruminant Herds with Disease



Presence of diseases, access/quality of vaccines: coverage rates from vaccination campaigns routinely fail to reach 80 percent, which is the minimum needed to protect herd health against major diseases. Herders mix traditional and modern veterinary treatments with imported medicines of dubious efficacy. Figures 9 and 10 indicate the prevalence of the types of diseases among cattle, sheep, and goats in these West African countries (based on information from Burkina Faso). The spike in ‘others’ in 2014 may reflect the onset of an epidemic of misdiagnosed small-ruminant pest.

Lack of year-round feeding: Husbandry entails moving animals between grazing and water, covering large distances at the hottest time of the year when both are in short supply, putting severe stress on the animals. Each year, animals put on weight during the second half of the calendar year when rain-fed pasture is available. During the more stressful dry-season months, they lose part of the weight they previously gained.

Key Takeaways

- Cattle, sheep, and goat production and stocks have been increasing, but productivity still remains low.
- The majority of production in West Africa is from transhumant and nomadic pastoralism.
- Diseases, access to quality veterinary services/medicines, and animal-husbandry practices limit productivity.

DEMAND FACTORS

Figure 11 - Consumption of Cattle Meat (2009–13, tons)

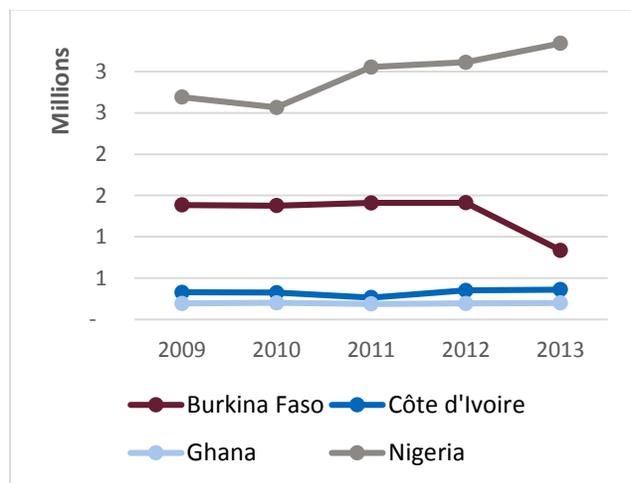
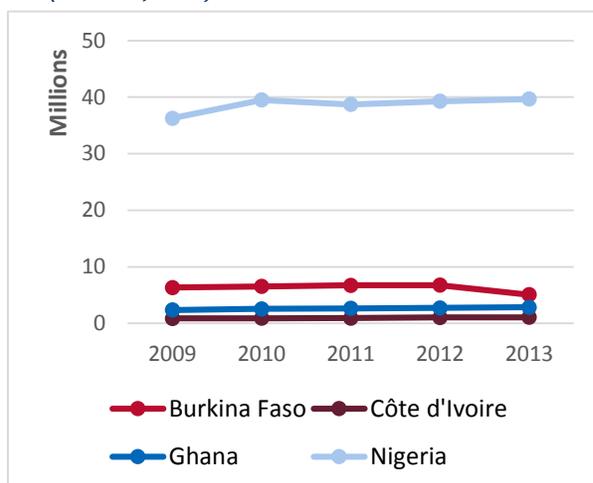


Figure 12 - Consumption of Sheep & Goat Meat (2009–13, tons)



SUPPLY FACTORS

Figure 13 - Live Animal Stocks: Sheep & Goat (2009–13)

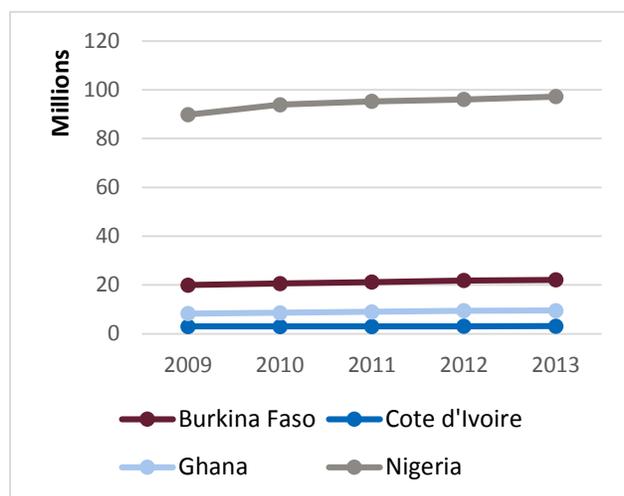
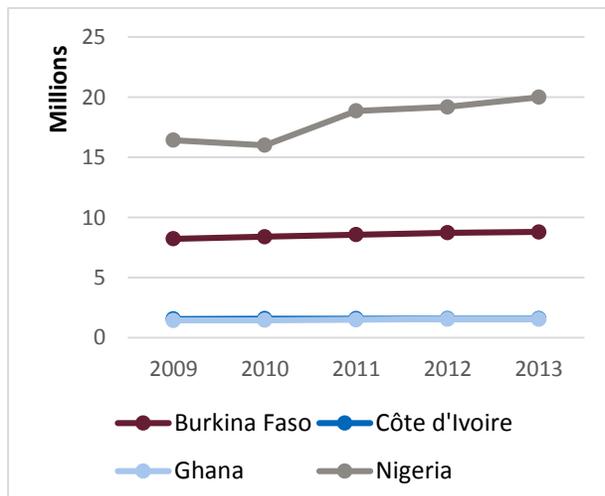


Figure 14 - Live Animal Stocks: Cattle (2009–13)



REGIONAL TRADE—CATTLE

Even though livestock marketing occurs year-round, there are two primary seasons: October to April (dry season) and May to September (wet season). Prices are at their peak during the period from May to September when livestock rearers intensify efforts to secure available pasture (USAID 2014, p.15).

Figure 15 - Live Animal Imports: Cattle (heads, 2009–13)

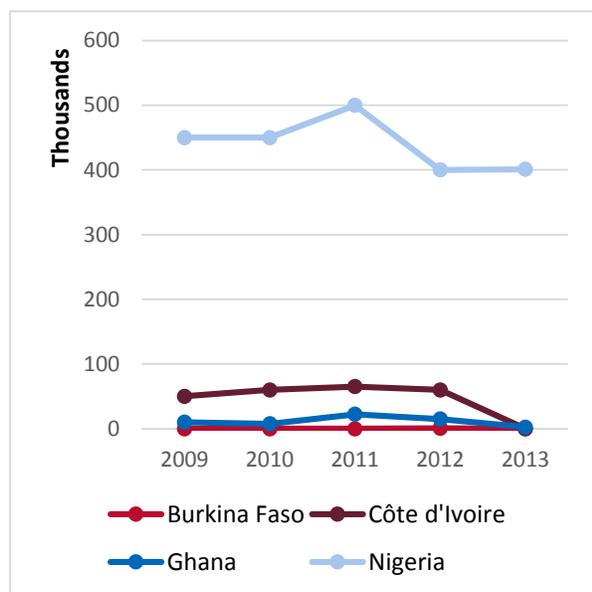
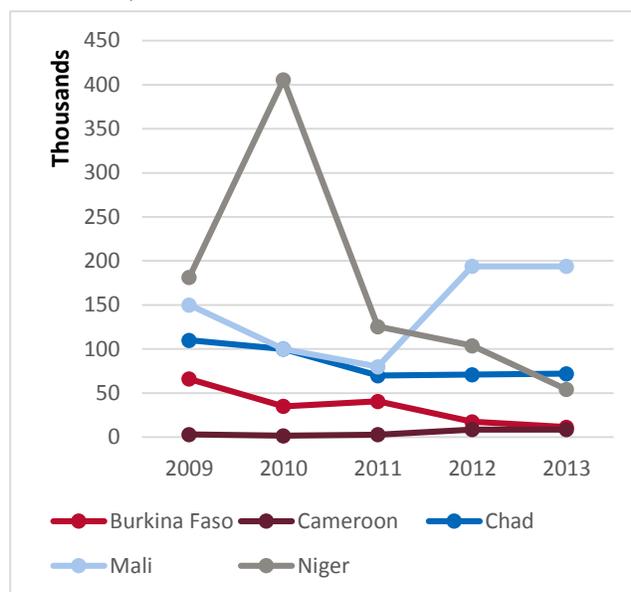


Figure 16 - Live Animal Exports: Cattle (heads, 2009–13)



REGIONAL TRADE—SHEEP AND GOATS

Figure 17- Imports of Sheep and Goats (2009–13)

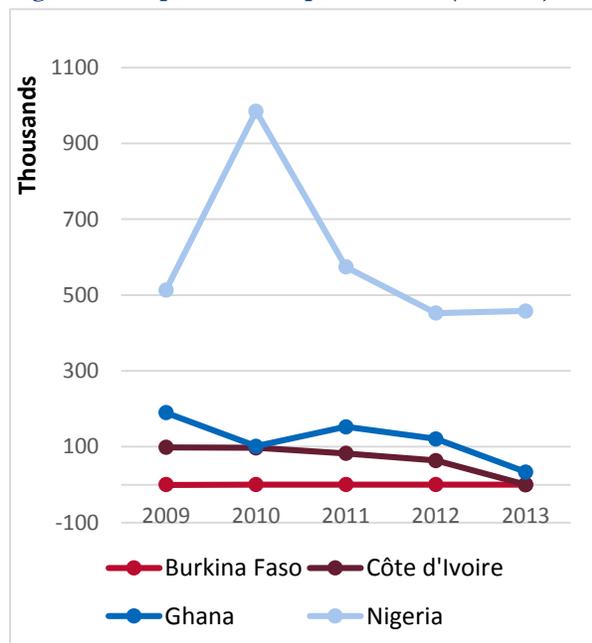
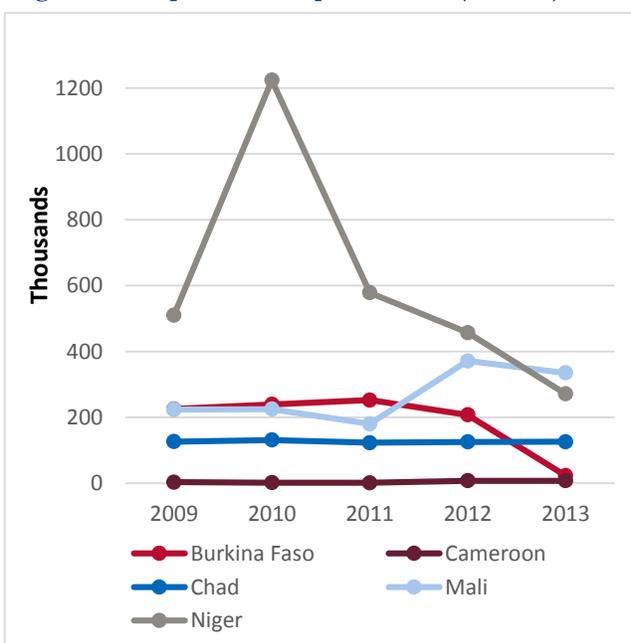


Figure 18 - Exports of Sheep and Goats (2009–13)



BREEDING AND ACCESS TO GENETIC MATERIAL

Most cattle and sheep raised in the main arid and semi-arid regions have evolved to cover ground efficiently between water points and pasture and to tolerate heat. They are not efficient meat and milk producers, taking roughly twice as long as European production systems for the same output, as the table below shows. Exotic breeds with significantly higher productivity struggle with the West African heat. Therefore, wealthy rearers in peri-urban locations who want animals that will fatten will cross exotic breeds with the best local genetic material, using exotic studs or artificial insemination using their sperm. Rearers maintain the crossbreeds close to home, provide them with good veterinary care, and fatten them to maximize profit from the investment.

Table 7 - Zootechnical parameters for African and European Cows

Stage	African	European
Age at first birth (months)	48	24
Birth interval (months)	18	12
Age at slaughter (years)	10-12	6
Mean number of births	2.1	4

Sources: (Wilson 1985) & (Compassion in World Farming 2012)

In Ghana, there is ready genetic material available at the Armrahia cattle farm and Adedome cattle ranch for improving local cattle, such as the West African Short Horn (WASH) cattle, via artificial insemination. The government also imports semen from Holland and Australia to improve local breeds. Regional breeds, such as the Sokoto Gudali, and the white Fulani from Niger and Mali also service the local Sanga breed in Ghana. These breeds resist diseases and harsh weather, produce high carcass yields due to their large size, and potentially produce higher quality meat.

The National Animal Production Research Institute (NAPRI) in Nigeria is presently working on developing and improving Sokoto Gudali cattle, Yankasa sheep, and Red Sokoto goats for multiple births, improved growth rates, and increased milk productivity. Côte d'Ivoire had ranches in the north of the country before the recent periods of civil insecurity (2002–07 and 2010–11), but these were looted and trashed. This diminished the country's ability to improve breeds for promotion or marketing purposes. The project, Programme de Gestion Intégrée des Ranches (PROGIR) and the Research Institute, l'Agence Nationale d'appui au Développement Rural (ANADER), are starting to relaunch development of genetic breeds, but both programs are still in the embryonic phase. In Burkina Faso, a government-run genetic-improvement center was not functioning in 2014. The Projet d'Amélioration de l'Élevage du Zébu Azawak worked with herders to improve the genetic stock of cattle used for milk production and fattening using the Azawak breed from Niger. The project progressed slowly because of the high cost for participants, particularly for women, and other weaknesses in the project.

ROLE OF CONFLICT AND SECURITY

Conflict and security issues adversely affected these value chains, as well as regional and national trade. Conflicts and tension between the pastoralists and farmers have been ongoing for decades, while the emergence of insurgent and terrorist groups such as AQIM and Boko Haram pose a recent and serious threat to the livelihoods of actors in these value-chains. Below are some of the cited issues, mostly affecting the livestock value-chain.

Mobile livestock rearers trek their animals away from conflict and insecurity. This leaves pasture under-grazed in some areas and overgrazed in others. Transhumant herders fleeing northern Mali due to AQIM have crossed the border into northern Burkina Faso, which is also somewhat insecure. This migration causes an increase in animal density in northern Burkina Faso, leading to overgrazing, reduced animal nutrition, and a greater mixing of herds, particularly at watering points. This environment creates the perfect conditions for the spread of disease. Veterinary care is less available in northern Burkina Faso due to insecurity, so disease may go untreated. The outcome is that ruminant health declines and epidemics become more frequent.

Photo 5 - Maiduguri Cattle Market in Nigeria



Outdated legislation on grazing and customary practices in these countries contribute to conflict between pastoralists and landowners/farmers. In Nigeria, the government is trying to introduce cattle ranches as a lasting solution, as ranches increase the productivity of cattle rearing than pastoralism. Fulani herdsman have rejected this offer and proffered the establishment of grazing reserves and routes (Premium Times 2016).

The presence of Boko Haram in Nigeria and AQIM in Mali has disrupted the cattle trade and markets in these countries. The Nigerian government shut down the cattle market in the northeastern city of Maiduguri—one of the largest cattle markets in West Africa—for three months, affecting the livelihoods of stakeholders in the value chain and the two million people displaced by war. Officials claimed that insurgents had been stealing cattle—up to 500 cattle according to individual accounts—to feed its fighters and raise funds. Due to the closure, the army stopped incoming trucks, and 400 animals died as a result, presumably from lack of food, water, and poor conditions. Meat prices increased almost 300 percent during that time. The market also serves neighboring Cameroon, Chad, and Niger. (Laessing 2016).

Key Takeaways

- Insecurity displaces livestock, which accumulate in other areas, increasing grazing pressure and the spread of disease. If veterinary care is not available in such destinations, disease can spread and develop into epidemics.

5.3 POULTRY

COMMODITY DESCRIPTION: VARIETIES, GRADES, AND STANDARDS

Poultry in West Africa consists mainly of chickens and guinea fowl. The current study deals only with chickens. Most chicken farmers practice layer production since they can derive revenues from both the sale of eggs and spent hens. Sales of tender broilers must compete with cheaper imported chickens. Per capita poultry production in West Africa is 4.4kg/capita. Per capital consumption of poultry in West Africa was 5.1 kg/capita in 2010 (Anderson 2010). Ghana is at 5.6 kg/capita compared to rest of the world, which is at 13.5 kg/capita in 2016 (OECD 2016).

Broilers are mainly marketed during festive periods such as Muslim festivals, Christmas, and Easter. However, some steady year-round sales take place to restaurants and supermarkets. Broilers attain 2.0–2.5 kg live weight (1.5–1.9 kg dressed weight) at six to seven weeks of age and are ready for the market. Layer birds reach 16 weeks before pullets start laying eggs. Layers provide eggs for over a year and are culled and sold when they stop laying. The industry’s average egg production is 230–250 eggs per layer per year. The average cost of producing broilers in Ghana in 2012/13 was estimated at US\$7 for large-scale producers and higher for small-scale producers (Ashitey 2013). This makes local chicken very expensive because 1 kg of imported chicken costs GHC 25, while locally produced chicken costs GHC 40. West Africans generally prefer indigenous varieties for religious rituals and traditional cooking (for its tougher meat and flavor). Tender imported meat tends to fall apart in stews that require a lot of time (Evans 2010, p.3). Poultry sectors in West Africa are struggling to compete against imports and employ bans to stimulate the sector.

Photo 6 - Frozen chicken in supermarket in Abuja



Key Takeaways

- Poultry in West Africa consists mostly of layers in order to benefit from income from sale of both eggs and spent hens.
- West Africans prefer indigenous birds for their flavour and tougher meat in local stews.
- The sector struggles to deal with cheap imports and practices import-substitution strategies.

Figure 19 - Value Chain Map: Layer Chickens/Eggs

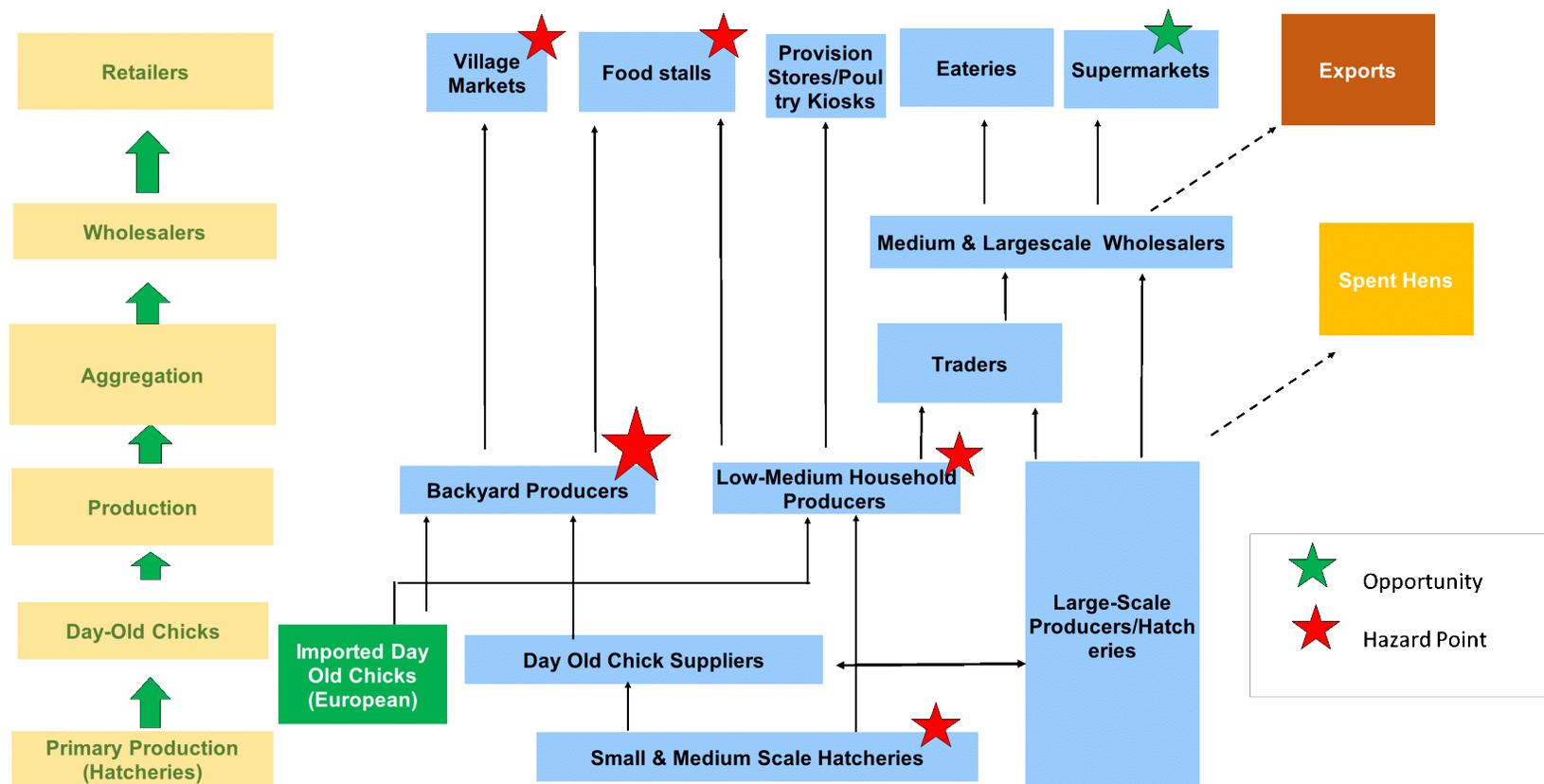


Figure 20 - Value Chain Map: Broiler Chickens

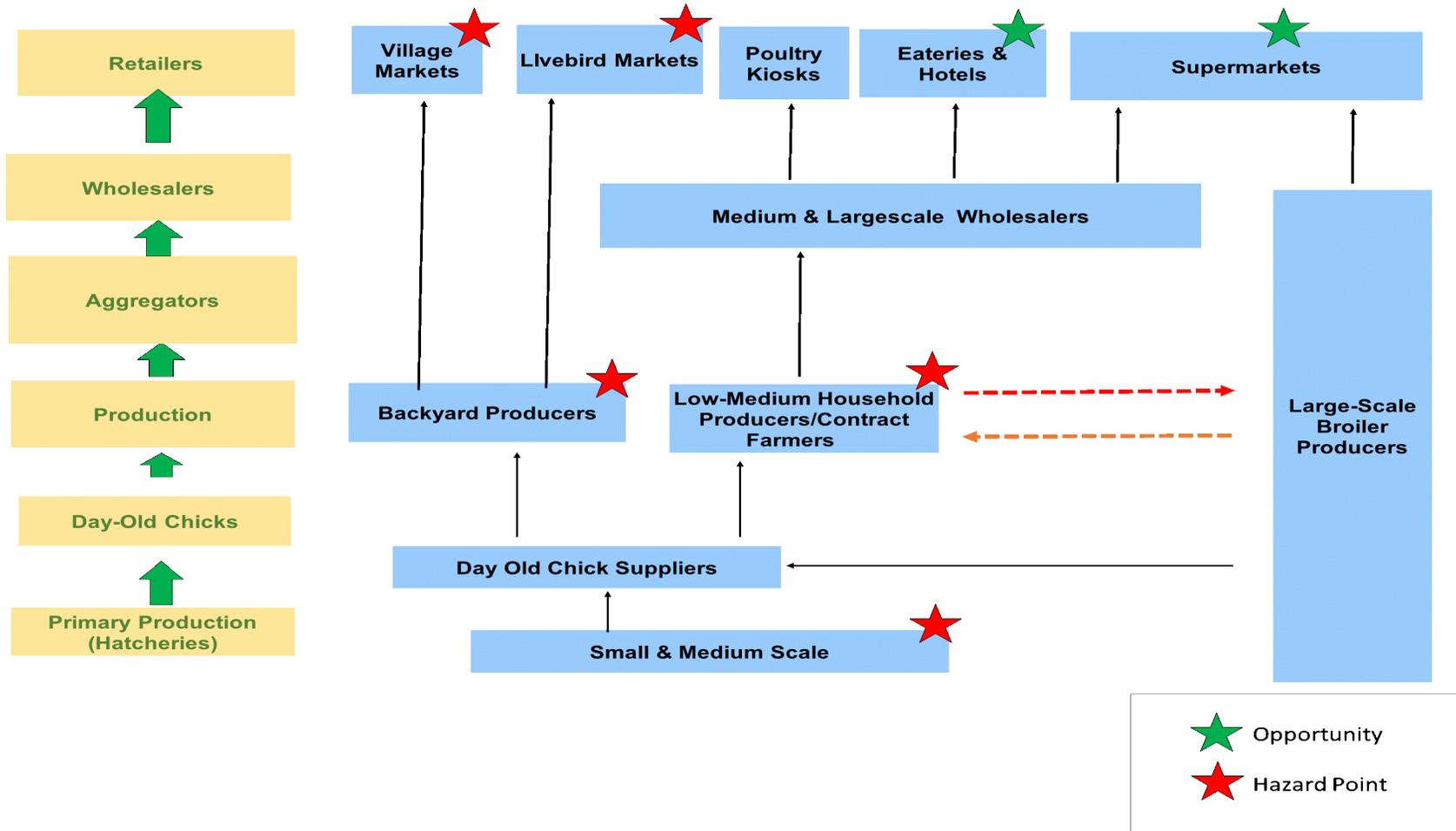


Table 8 - Explanation of Hazard Points and Opportunities

The green arrow below illustrates the direction of the value chain, from the upstream actors (hatcheries) to the downstream ones (buyers).



Value Chain Actor	SPS hazard point
Small- and medium-scale hatcheries	The parent stock normally pass diseases to their day-old chicks, leading to early mortality. They include salmonellosis, Marek's disease, and lymphoid leucosis aspergillosis/mycotoxicosis. Mycotoxicosis can also occur from poultry feed.
Backyard producers	Arbitrary use of poultry drugs leaving residues; uncontrolled roaming leading to mixing with nearby, potentially infected birds.
Low-medium household producers	Similar to above.
Large-scale commercial producers	Large volume of birds in close proximity makes the incidence of disease more destructive.
Village markets/Live bird markets	Insalubrious conditions at markets; cramped cages; mixing of birds at large volumes; arbitrary use of poultry drugs leaving residues, contributing to antibiotic resistance in humans.
Food stalls	Poor hygienic practices of the food handler and insalubrious conditions for food consumption.
Supermarkets	Potentially poor hygienic practices of poultry meat handler.

Table 9 - Explanation of Variation by Country

ITEM	Nigeria	Côte d'Ivoire	Burkina Faso	Ghana
Veterinary law	✓	✓	✓	✓
Veterinary law harmonized with ECOWAS/CÉDÉAO framework	✓	✓	✓	✓
Imports day-old chicks	✓	✓	✓	✓
Import bans	✓	✓	✓ ⁷	✓
Poultry grades	✓	✓	✓	✓
Poultry associations (advocacy and education)	✓	✓	✓	✓
Presence of modern integrated poultry farms	✓	✓	-	✓

TRADE CORRIDORS

Levels of official intra-regional poultry trade are not significant in the countries examined, since all ECOWAS nations have implemented import bans on countries affected by avian influenza (AI), either in the past or recently. Due to a lack of self-sufficiency in production, imports take place from non-AI-afflicted countries in the world market. Live birds informally cross internal ECOWAS borders, but numbers are hard to obtain. Although numerous flows of poultry and day-old-chicks exist, the map below displays the previous major pathway of Côte d'Ivoire to Ghana. The case study that follows explains this map in more detail.

Key Takeaways

- Ongoing import bans due to AI have curbed all formal regional trade.
- All members are net deficit producers except Burkina Faso.
- Ghana exports some cross-border poultry to Côte d'Ivoire.

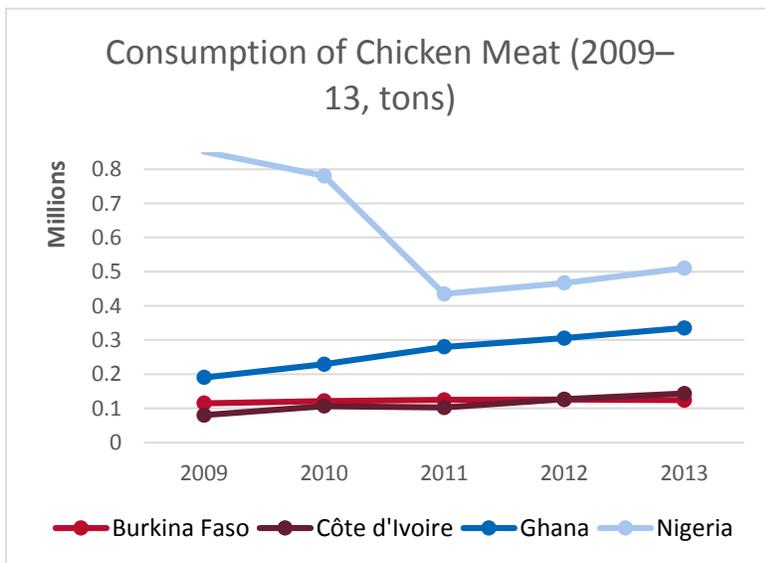
⁷ All ECOWAS/CÉDÉAO countries have a temporary ban on poultry imports due to the avian influenza outbreak.

Figure 21 - Poultry Trade Flow Map



DEMAND FACTORS

Figure 22 - Consumption of Chicken Meat (2009–13, tons)

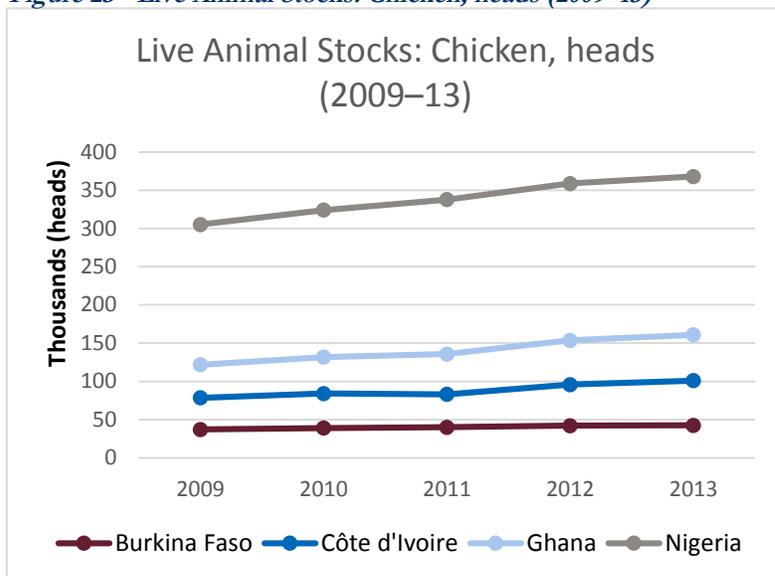


SUPPLY FACTORS

Production & Productivity

The chart to the right displays an estimate of chicken stocks in the four countries, including domestic production and imported poultry. Overall stocks have increased in West Africa, but this does not mean productivity is increasing. Traditional systems produce birds characterized by low productivity as compared to modern operations. A number of factors determine productivity, including the number of eggs laid per year, egg weight, time to reach sexual maturity, carcass weight at maturity, and hatchability of eggs. Productivity for indigenous birds is starkly poor compared to that of exotic ones.

Figure 23 - Live Animal Stocks: Chicken, heads (2009–13)



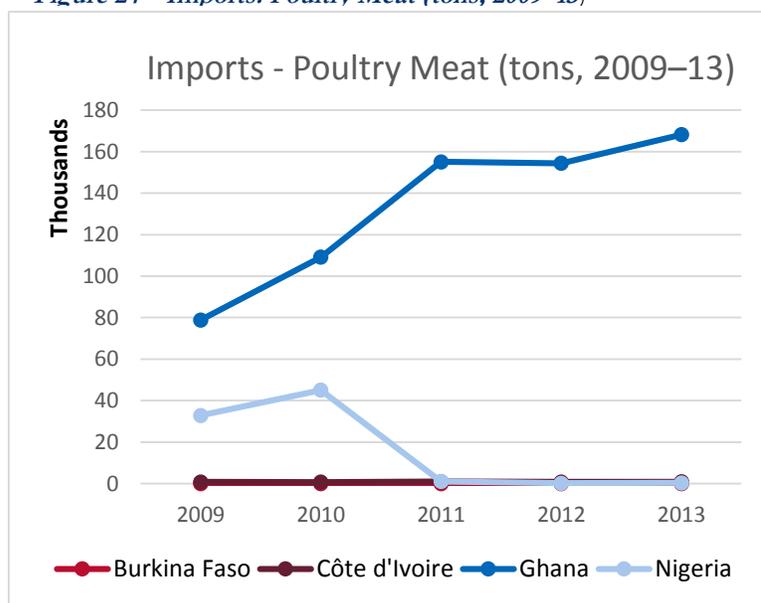
Productivity would increase with improvements in:

- Biosecurity: transport infrastructure, refrigeration, slaughter facilities, vaccinations and biologicals against disease, and access to veterinary services
- Animal husbandry practices: shelter from inclement weather and predators, regular and nutritional feed, breeds of day-old chicks

REGIONAL TRADE

With the exception of Burkina Faso, Côte d'Ivoire, Ghana, and Nigeria do not produce enough poultry to export in significant quantities. illegal informal trade of live birds does occur across the borders, but numbers are difficult to obtain. Nigeria imposed import bans on poultry products a few times since the outbreak of AI in 2006 and again in 2010 due to its resurgence. as a result, there have been noticeable declines in imports. in mid-September 2015, the Nigerian government destroyed more than 2,000 cartons of poultry products illegally imported into the country (KAROMBO 2015). Ghana has seen

Figure 24 – Imports: Poultry Meat (tons, 2009–13)



Source: FAOSTAT 2016

increasing chicken imports, mainly from the U.S., E.U., and Brazil, to meet its production deficit. import numbers are declining, but in 2015, it imported 144,000 tons (KAROMBO 2015). according to the Ghana poultry association, since the country produces strictly layer chickens, it imports 95 percent of frozen broilers, while 2–5 percent come from domestic production.

The Ghanaian government instituted a “Broiler Revitalization Project” and a policy of reducing frozen-chicken imports into the country. These new policies are to encourage local hatcheries to produce more broiler chickens to feed the population. Ghana is importing an increasing numbers of day-old chicks for broilers since there is an increase in consumption of broiler meat. However, most poultry producers prefer layers, which are a more profitable business due to the frequency with which layers produce eggs and the turnaround time to sell spent hens.

BREEDING AND ACCESS TO GENETIC MATERIAL

Management of breeding varies with the production system. In traditional systems, unplanned, random mating generally occurs. Farmers exchange breeding stock with other farmers in these traditional systems, and preference goes towards those with certain phenotypes (Gondwe 2004). The majority of traditional systems use and breed indigenous birds, while modern ones use crosses of exotic and local breeds. Indigenous birds are better adapted to the region and conditions, can survive with less feed, and are more resistant to local pathogens.

Local consumers also prefer the taste and hardiness of indigenous birds’ meat, which better endures long preparation periods for traditional stews. Modern production exploits exotic breeds for higher productivity, crossed with indigenous birds. Due to the import bans on poultry products and weakened exchange rates in some countries, poultry producers struggle to access this more productive parent stock.

Ghana only has six operational hatcheries, contributing to the country’s local production deficits. As a result, in 2015 it imported over five million day-old chicks, mostly from Europe (Karombo 2015).

Nigeria banned the importation of parent stock and live birds, leaving few breeds available in the country. The NAPRI, which is responsible for developing animal breeds in the country, successfully developed the Shika Brown, an indigenous Nigerian layer bird that is more resistant to poultry diseases. Broiler farmers use the Cobb breed and others. The Bill & Melinda Gates Foundation is conducting a five-year project to compare the performance of the Kuroiler bird—a hybrid chicken from India—with native breeds in Nigeria, Ethiopia, and Tanzania. The Kuroiler produces five times the number of eggs per year (150–200 versus 40) and attains almost twice the body weight (3.5 kg versus 2kg) in less than half the time of indigenous backyard chickens. Kuroilers are also vaccinated at hatch, greatly reducing disease-related mortality (Harth 2015).

Côte d’Ivoire and Burkina Faso import day-old chicks, but the latter has also started to produce its own.

Key Takeaways

- Traditional breeding systems are still widespread with production using indigenous bird breeds
- Import bans and weakened exchange rates have made access to day old chicks more difficult, especially in Nigeria.
- Introduction of exotic breeds and/or crosses with local breeds serve as opportunities to improve disease resistance and improve productivity.

Case Study: Trade between Côte d'Ivoire and Ghana

The area around Agnibilékrou in Côte d'Ivoire, near the Ghana border, grows maize to feed local poultry farms that principally serve Abidjan. Locally marketed maize surpluses do not meet the farms' needs, so the area imports it from northern Côte d'Ivoire (although part of the maize probably comes from Burkina Faso, at least during some seasons). The biggest vertically integrated chicken-producing company, Foani, occasionally commissions another company to buy maize in Ghana (but only if there's a lack of maize on the local market). In contrast, a lot of maize flows across the border into Ghana because western Ghana has many poultry farms and a substantial demand for maize for human consumption: after the maize harvest, more than a hundred 45t trucks cross each week.

Foani claims that subsidies given to the chicken sector in Ghana mean that Ivoirian chickens are not competitive, so the company does not export there. Rather it exports chicken feed (produced in its Agnibilékrou factories) and day-old chicks to supply its outgrowers' chicken farms in Ghana and imports broilers from Ghana to Agnibilékrou for slaughter and dressing. Then the company distributes chilled dressed chicken to the rest of Côte d'Ivoire. In addition, a large but unquantified number of eggs are exported to Ghana. This bi-directional trade takes place without significant phytosanitary oversight: there is political pressure to allow it to pass without hindrance. This also makes it difficult to collect reliable data for statistics.

Truckers avoid phytosanitary checks. There are five control posts along the road on the Ivoirian side of the border. In principle, each control post has customs and police officers, plus a phytosanitary agent. However, the Ministry of Agriculture staffs only two of the five phytosanitary posts. Truckers do their utmost to avoid phytosanitary controls. On the rare occasions that phytosanitary agents confront truckers, the latter refuse to allow their trucks to be inspected, often with support from customs and police officers. Since the phytosanitary agents have no coercive means, the truckers pass with impunity. There is the sense that the customs and police services do not want the phytosanitary agents to interfere with illegal trade from which they collect bribes. The trade may not be entirely of agricultural products: other items might be in the trucks passing in each direction, but it is impossible to say without. Whatever the larger game may be, phytosanitary control is lost.

The ECOWAS SPS regulation exempts unprocessed agricultural products from the need for a certificate of origin but requires them to be accompanied by a phytosanitary certificate. However, the two manned phytosanitary posts offer maize exporters a certificate of origin rather than a phytosanitary certificate. In practice, exporters don't bother with documentation for their exports: as of May 2016, the last request from an exporter for a certificate of origin had been in May 2014. This may partially explain why two phytosanitary agents gave quite different independent figures for the cost of a certificate of origin per truck: 5,000 and 30,000 FCFA.

At each of the five posts, the agent's only office is a container with a table and two chairs. Agents have no vehicles or motorbikes to travel to the unmanned posts, nor do they have equipment, such as probes, magnifying glasses, or sieves.

6. TRADE IMPACTS OF SPS ISSUES

It is a significant challenge to estimate the trade impacts of SPS issues on firms and societies. While the estimated costs are enormous (see text boxes in this section), our bases for calculation are conservative. This study bases the economic cost of SPS factors on an estimated 15 percent reduction in productivity and post-harvest losses to maize; for livestock, bases estimated losses on 20 percent loss due to mortality and morbidity; losses from AI are based on an estimated live bird value of \$2.50 per kilo. The largest cost might be the cost of stunting due to aflatoxin absorption. While researchers now consider environmental enteric dysfunction (EED) to be the leading cause of stunting, and exposure to aflatoxins is one of the causes of EED, the casual relationship of aflatoxins to EED requires additional research.

Aflatoxin. Aflatoxin in West Africa principally infects maize and groundnuts. Maize fed to ruminants and poultry leads to further concentration of aflatoxin in eggs and meat products. Human consumption of eggs and meat further concentrates aflatoxin. Aflatoxin diminishes the productivity and increases the mortality of fed animals. Aflatoxin concentration in poultry has wiped out whole flocks.⁸ Aflatoxicosis in animals leads to gastrointestinal dysfunction, reduced reproductivity, reduced feed utilization and efficiency, anemia, and jaundice. Aflatoxin is concentrated in slaughtered contaminated animals and is passed on to humans. For decades, the principal known risk of aflatoxin to humans was as a carcinogen. Recent research identified aflatoxin as a principal cause of EED, one of the leading causes of stunting in infants and children (SHINE 2015). Researchers do not yet fully understand aflatoxin's contribution to stunting, but the economic cost of stunting to developing countries is enormous, measured as the increase in infant mortality and the permanent reduction in brain development resulting in lifelong loss of productivity and income.⁹

Avian influenza. As of June 2016, over 2 million birds were recorded lost to the disease or to culling as a mitigation measure. To date, the four focus countries have identified the virus, as have others in the region. AI control is currently the principal preoccupation of veterinary service agents in each of the four countries researched. The risk of AI jumping into human populations is the principal public health concern. Counting only current loss of flock at an estimated live-bird value of US\$2.50, the cost of AI to ECOWAS member states exceeds \$5.0 million dollars to date.

Insect and viral maize pests. The economic cost of insect pests occurs during production and post-harvest storage, both in terms of reduced yields and post-harvest losses. Insects are the principal cause of post-harvest losses in maize. There are few reliable measures of crop losses, but researchers often cite 30 percent of total crop value. Without the use of crop pesticides and storage fumigants, the actual losses can easily exceed 30 percent.

Post-harvest insect damage can cause:

- Loss of grain weight due to insect feeding
- Loss in quality due to:
 - Impurities like droppings, cocoons, and insect parts, which may also lead to microbial infestation as a result of increased temperature and moisture

⁸ Field interviews

⁹ An 11 percent increase in GDP could be achieved with a 20 percent decrease in stunting.

- Reduction of nutritional value
- Reduction in germination ability for seeds
- Creation of localized hot spots within the grain that may initiate wet heating, causing stack collapse due to weakened bag fiber
- Blockage of processing machinery by webbing, at times destroying milling machinery
- Cross-contamination of processed foods by insect vectors in milling machinery.

Pesticide Residues. Improper use and disposal of pesticides on standing crops can cause downstream damage to fisheries and human water sources. Harmful pesticide residues exist in crops and stored grains. Use of banned and/or counterfeit pesticides is an additional problem, exacerbated by porous land borders and poor monitoring by customs authorities. Traders frequently use aluminum phosphide, or phostoxin, in grain storage as both an insecticide and a rodenticide. In several of the countries visited, we noted a significant misuse of phostoxin as a fumigant. Traders should treat storage facilities with phostoxin prior to grain storage, with a second fumigation through the oxidation of pellets in a warehouse. However, multiple traders practiced placing a phostoxin pellet in each bag of grain. Not only is this costly for the trader, but the powdery residue from oxidation is a rodenticide and equally dangerous to humans. In Ghana, the private industry association the Ghana Grains Council (GGC) conducts education for farmers and traders on the appropriate use of pesticides on fields and in storage.

Key Takeaways

- SPS losses to livestock and maize potentially exceed \$32.3 billion (2013 dollars) in the study countries.
- Avian influenza cost over \$5 million between January and June 2016.
- In Nigeria, excessive pesticide residue in food caused over 200 fatalities in 2015.
- The estimated opportunity cost from aflatoxin's contribution to stunting exceeds \$255 billion.

Livestock diseases: Interviews with veterinary directorates from the four study countries suggest that animal mortality and morbidity reaches or exceeds 20 percent of livestock by value. The lack of widespread vaccination use by pastoralists and backyard poultry producers is the principal contributing factor to these losses. Larger poultry operations and most ranches access vaccines in a timely and effective fashion. Estimating lost value to the livestock and maize sectors as an opportunity cost for the four study countries exceeds a potential \$32 billion annually, based on the 2013 figures provided by FAOSTAT.¹⁰ Table 11 documents these costs.

¹⁰ The report makes estimations by obtaining the most recent production and price data from FAOSTAT (2013). Production data was in units of tons/year, multiplied by the average price of the commodity/ton in 2013 by country. Although price data was sourced from FAOSTAT, not all prices could be obtained from specific countries for specific commodities. Therefore, the report employed a proxy from the region or used data obtained from secondary sources. In the case of Côte d'Ivoire and Burkina Faso, the price data for eggs utilized represented a regional annual average from Mali of \$3,380.28/ton. In Ghana, this figure was \$2,364.24/ton. The report obtained the value of about \$527 million in Nigeria from a secondary source (<http://www.thepoultrysite.com/reports/?id=1596>). For maize, the report utilized the price proxies of Mali (\$352.31/ton) for Burkina Faso, while Togo prices (\$309.79/ton) served for Ghana and Côte d'Ivoire. The \$32.8 billion figure serves as an illustrative estimation given the difficulty of obtaining precise data, and demonstrates the potential magnitude of the opportunity cost.

Table 11 - Maize Production and Post-Harvest Losses (2013)

Table :Maize Production and post-harvest losses (2013)			
Country	2013 Maize production ('000 MT)*	Value (\$'000) @ \$253. US/MT**	Production and post harvest loss estimates from SPS (Billion \$)***
Ghana	1,800	275,400	\$ 0.6
Nigeria	7,200	1,101,600	\$ 2.2
Cote d'Ivoire	700	107,100	\$ 0.2
Burkina Faso	1,500	229,500	\$ 0.5
Total	11,200	1,713,600	3.4
*Source: FAO Stat			
** Estimated farmgate maize prices (field interviews)			
*** Estimated production and post-harvest losses (field interviews)			
**** Mortality and morbidity losses from animal pests and diseases (field interviews)			

Source: FAO 2013

Table 11 - Economic Costs from SPS Issues

Country	Cattle Meat Consumption in \$ (2013)	Sheep & Goat Meat Consumption in \$ (2013)	Chicken Meat Consumption in \$ (2013)	Eggs Consumption in \$ (2013)	Maize Consumption in \$ (2013)	Loss of 20% for livestock and 15% for maize
Burkina Faso	1,670,916,000	15,218,793,000	308,610,000	202,901,408	558,558,616	\$ 3,564,027,874
Côte d'Ivoire	716,210,000	3,166,605,000	355,352,500	155,492,958	204,859,480	\$ 909,461,014
Ghana	387,672,000	8,501,340,000	413,222,500	97,702,209	546,617,330	\$ 1,961,979,941
Nigeria	6,682,000,000	118,988,601,000	1,274,955,000	527,490,000	3,023,570,077	\$ 25,948,144,711
Total	9,456,798,000	145,875,339,000	2,352,140,000	983,586,575	4,333,605,502	\$ 32,383,613,540

Source: FAOSTAT 2013

7. PRIORITY OPPORTUNITIES FOR INVESTMENT

The following table summarizes the opportunities and recommendations for investment identified by the assessment team. While it is difficult to rank these in order of importance without a consensus on criteria, some recommendations can have a radical impact on the industry, if successfully implemented. In the table below, the team placed a green star by those opportunities we consider potential game changers.

The careful reader may note the absence of recommendations leading to upgrades at the border posts, despite our visits to numerous border posts. We are cautious to propose significant testing and enforcement capacity at border posts for two reasons. First, ECOWAS guidelines allow free movement of agricultural products across borders unless such movement constitutes a national biosecurity risk. It is essential for border posts to monitor and test in the event of disease outbreaks such as AI or if maize lethal necrosis reaches the region. In such an event, however, borders must necessarily close to all poultry or maize product respectively. Enhanced testing will be less important than rapid scale up of policing.

Second, if increased inspection at border posts results in higher costs imposed on traders, traders have an incentive to avoid border controls as they move product across national boundaries. In this case, it makes more sense to move testing to its destination point. If traders realize that delivering contaminated product means no payment or a steep discount on their product, they will be more likely to impose testing on their suppliers. This will further stimulate demand for testing at point of origin.

Recommendations that apply to the maize sector must begin by not limiting their scope to maize alone. Over the course of this assessment, it became clear that trade is the principal driver of concerns about SPS issues. This includes trade across ECOWAS member states, trade outside of the ECOWAS region, and the internal trade from external companies doing business in the region, e.g., Nestlé, KFC, and breweries. The most effective way to increase recognition of the importance of SPS issues is through trade in which buyers, and/or good business sense, mandate compliance with higher standards. Maize productivity in the ECOWAS region is still so low that it does not qualify as a significant traded commodity. Groundnuts, cowpeas, other beans, and horticultural crops are more important to trade. Ensuring that these commodities meet or exceed global standards for plant protection is essential to facilitate exports and avoid export bans.

While maize is an essential food-security crop in the region and the principal input into the poultry sector, ensuring safe maize for consumers and poultry producers requires the use of strategies not limited to this commodity.

The recommendations in the table are intentionally brief. A more complete analysis of any recommendation would require a longer discussion as part of a design process. The summaries in the table should explain the opportunity and the rationale. If a reviewer wishes to pursue any of these recommendations, he or she will need to conduct further analysis.

Table 12 – Comprehensive Table of Recommendations

Proposed investment activity & rationale	Key counterpart bodies	Estimated cost ¹¹	Estimated impact	Potential difficulties	Target countries
SPS – general					
<p><i>Investment:</i> Creation of regional public-private fora to establish SPS priorities.</p> <p><i>Rationale:</i> SPS compliance is a public good, the demand for which is driven by trade. Inclusion of private actors in the policy dialogue will focus and prioritize the SPS agenda.</p>	ECOWAS, UEMOA, National Plant Protection bodies, industrial food and feed mills and breweries, maize industry associations, chambers, public-health agencies, consumer associations.	<p>Low</p> <p>STTA and convening of regional and national fora.</p>	<p>Large¹²</p> <p>Private participation in the SPS prioritization process will help focus and improve targeting of limited resources.</p> <p>As trade drives demand for improved SPS controls, improvement in SPS controls will arise from trader demand.</p>	<p>Challenges to building consensus between public and private-perspectives.</p> <p>Turning talk into action.</p> <p>Sustaining public-private dialogue with limited donor funds.</p>	<p>Countries with significant and expanding maize-processing capacity:</p> <ul style="list-style-type: none"> - Ghana, Nigeria, Côte d'Ivoire, Senegal - Other countries with significant maize production: Burkina Faso, Mali 
<p><i>Investment:</i> Increase availability of laboratories capable of testing for pathogens, parasites, and toxins, including:</p> <ul style="list-style-type: none"> • Increased number of accredited labs • Upgrading existing public and private laboratories • Facilitation of public outsourcing to private laboratories 	National standards authorities and bodies, private laboratory operators, RESAOLAB, WHO/AFRO	<p>Medium if limited to certification and training</p> <p>High if including construction and equipping of laboratories</p>	<p>Large</p> <p>Increased trade volumes from more timely and reliable testing</p> <p>Increased food safety and public capacity to control for pests and diseases</p> <p>Cross-border credibility and sharing of testing results.</p>	<p>Adequacy of laboratory-worker training and certification</p> <p>Maintaining accreditation</p> <p>Limitations on public-sector willingness to outsource to private labs</p> <p>Market demand analysis should precede investment</p>	<p>Prioritize countries with highest industrial food and feed manufacturing capacity</p> <ul style="list-style-type: none"> - Nigeria, Ghana, Côte d'Ivoire

¹¹ Estimated Costs are categorized as low, medium, and high where low <\$1million; medium=\$1million, < \$5million and; high>\$5million.

¹² Impact of public private for a can be large if it is not limited to a single commodity but rather the set of traded crops. This includes maize but also groundnuts, cowpeas, and horticultural crops.

<p><i>Rationale:</i> Testing is frequently accompanied by long delays due to insufficient testing capacity; demand will continue to grow as trade increases; and private laboratories can attract commercial investment</p>					
<p><i>Intervention:</i> Continuing trade fora and formal-sector business-to-business (B2B) events to promote deals, including joint ventures between companies based in producing and consuming countries.</p> <p><i>Rationale:</i> It works. (see Trade Hub)</p>	<p>Entrepreneurs, SMEs, ministries of agriculture, trade, livestock; regional, Persian Gulf and Indian Ocean countries, USAID/WA Trade Hub</p>	<p>Low to medium, depending on the level of support provided</p>	<p>Medium</p> <p>Trade is driving domestic demand for improved SPS. As this demand increases, it will reach a tipping point beyond which more affluent domestic consumers will seek more hygienic food.</p>	<p>Importing countries impose excessively stringent standards</p> <p>Banks may be unwilling to grant credit to livestock-sector ventures</p>	<p>ECOWAS region</p>
Livestock (poultry, cattle, and small ruminants)					
<p><i>Intervention:</i> Reestablish para-vet system under supervision of licensed public &/or private veterinarians.</p> <p><i>Rationale:</i> Estimated loss in value to poultry, cattle, and small ruminants from increased mortality and decreased productivity exceeds 20 percent of the value of sold carcasses. Rural trained para-vets can reach and serve pastoralists and poultry producers in remote areas.</p>	<p>National veterinary services' regulatory agencies; EU's VACNADA project, Pan African Veterinary Vaccine Center of the African Union (AU/PANVAC), private veterinarians.</p>	<p>Medium to high</p>	<p>Large</p> <p>Increased livestock vaccinations and administration of other appropriate veterinary medicines to animals in remote areas will reduce the spread of transmissible disease, reduce morbidity due to other diseases, and increase production.</p>	<p>National government concerns with allowing para-vets to vaccinate</p> <p>Inadequate levels of supervision of para-vets</p> <p>Inadequate supply and/or quality of veterinary products</p> <p>Inadequate cold chain for storage and transport of vaccines</p>	<p>All</p> <div style="text-align: center;">  </div>

				Time required before para-vets can earn a reasonable income from service provision.	
<p><i>Intervention:</i> Cost-share grant support to private abattoirs to upgrade and obtain certifications for high-end domestic and export markets.</p> <p><i>Rationale:</i> Demand for high-quality slaughtered animals is growing. Only private facilities can attract commercial investment. Quality domestically slaughtered animals at the high-end of the market will 'pull' demand for higher quality at the next level.</p>	National ministries of agriculture and livestock; national veterinary services; public and private abattoirs; private abattoir management companies	High , due to construction and renovation costs	Medium to Large	<p>Lack of investor funds</p> <p>Domestic market demand does not pay for upgrades.</p> <p>Domestic prices are not competitive in export markets</p>	<p>Nigeria, Ghana, Côte d'Ivoire, Burkina Faso</p> 
<p><i>Intervention:</i> Training of lenders and small-scale poultry producers in biohazard and other sanitary controls.</p> <p><i>Rationale:</i> Lack of knowledge about how to minimize biohazard risks at small to medium scale poultry operations leads to high mortality and low productivity ratios.</p>	Financial institutions; National Veterinary Services Directorate; Private Veterinarians; Commercial Vaccine and Product Marketers; USAID/WA Trade Hub	Low	Large	<p>High interest rates reduce profit margins</p> <p>Default risk from flock loss to disease</p> <p>Lack of appropriate insurance products for poultry producers</p>	All West Africa countries

Lack of knowledge as to how to evaluate credit risk of poultry operations makes it harder to secure capital ¹³ .					
<p><i>Intervention:</i> Support value upgrading of Sahelian livestock chain near urban centers, including fatteners, breeders investing in cross-breeds improved feed and fodder mixes, and traceability to provide regional supermarkets with a higher-quality and disease-free product.</p> <p><i>Rationale:</i> Co-locating value-addition services reduces transport costs and animal weight loss from transport.</p>	Peri-urban fatteners in Sahelian countries; private abattoirs; supermarkets or other importers in the Sahelian and coastal countries; shipping companies (truck/air), banks, ministries of livestock & trade, West African Trade Hub	Medium, to High Abattoir/cold-chain investments, e.g. credit guarantees	<p>High</p> <p>Shipments could create new profitable end-market that incentivizes increased high-quality Sahelian production</p> <p>New end-market with higher hygiene standards would spur investments at the production and abattoir level to improve SPS measures</p> <p>If air shipments of meat to extra-ECOWAS countries are profitable, exports of meat could lead to excellent abattoirs in Sahelian locations.</p>	<p>Lack of infrastructure</p> <p>Lack of shipping infrastructure and cold-chain facilities</p> <p>Difficulties obtaining credit</p>	<p>Initially Mali, Burkina Faso, Côte d'Ivoire, Ghana;</p> 
Maize					
<p><i>Intervention:</i> Build processor awareness of mycotoxin hazards and facilitate commercial distribution of mycotoxin test kits.</p> <p><i>Rationale:</i> Greater buyer awareness and increased ease of testing encourages traders to avoid buying infected product but, conversely, testing at borders encourages traders to avoid them.</p>	National plant protection services; public & private testing laboratories,	<p>Low individual test kits cost \$300–\$800, with individual tests costing under \$10.</p> <p>Medium public-education campaigns</p>	<p>Large</p> <p>Controlling for aflatoxin by buyers will increase concern for controlling for aflatoxin at the farm gate as traders begin to refuse to buy untested maize.</p> <p>Trader unwillingness to buy infected maize will stimulate demand for Aflasafe and improved grain-storage practices.</p>	<p>Availability of test strips or chemicals (recurrent costs)</p> <p>Increased smuggling/informal trade to avoid tests or to offload maize that has failed tests</p> <p>Deciding whether to test at minor/informal border crossing points</p>	All maize-importing ECOWAS countries

¹³ Even with financial institution knowledge, interest rates are so high in many of the ECOWAS countries, that poultry sector loans must be limited to short-term working capital/

				Using/disposing of maize that has failed the test.	
<p><i>Intervention:</i> Development of a regional Maize Lethal Necrosis (MLN) prevention strategy and rapid response strategy for MLN containment in the event that the disease manifests in the region.</p> <p><i>Rationale:</i> Enormous crop loss from lack of disease containment.</p>	ECOWAS, UEMOA, Plant-health departments of Ministries of Agriculture, national agricultural research organizations, traders' and farmers' organizations	<p>Low</p> <p>Meetings</p>	<p>Very high</p> <p>Prevention will prevent enormous loss from disease</p>	<p>Lack of political priority</p> <p>Possible contamination from imported maize seed</p> <p>Possible contamination from sacks or vehicles carrying the virus entering via Sudan, Chad and into Nigeria.</p>	All countries but especially Niger and coastal countries
<p><i>Intervention:</i> Work through bilateral programs to train farmers and aggregators in the proper use and disposal of pesticides, aflatoxin controls and grain-storage fumigants.</p> <p><i>Rationale:</i> Reduction of human health risk from exposure to pesticides and reduction in stunting and avian mortality from aflatoxin exposure</p>	National Plant Protection bodies, Agricultural extension services; Industry associations, Cooperatives, farmer organizations, out-grower businesses, processors and input companies	<p>Medium if limited only to aflatoxin</p> <p>Low if built in to existing FTF programs</p>	<p>Large</p> <p>Reduction in excessive pesticides and mycotoxins will reduce animal and human mortality and morbidity.</p>	Poor conversion of training to behavior change	Maize and, more generally, cereal producing countries.
<p><i>Intervention:</i> National testing of aflatoxin biopesticide Aflasafe BF 01 developed by INERA in collaboration with IITA.</p> <p><i>Rationale:</i> Aflasafe effectiveness at soil treatment depends on identification and selection of appropriate inoculants, a precursor for development of the product for commercial distribution</p>	INERA, IITA Ministries of Food and Agriculture, commercial and smallholder farmers	<p>Low</p> <p>Tests in various soils, climatic regimes and types of cultivation</p> <p>Presentation of results</p>	<p>High</p> <p>Cost-effective method to counter aflatoxin in the field and thereafter during storage</p>	Commercial production of Aflasafe BF 01 needs the investment in laboratory/production plant to produce Aflasafe	Ghana, Burkina Faso, Côte d'Ivoire. 

		Formal registration			
<p><i>Intervention:</i> Support development of private commercial seed markets. This requires conditionally licensing of multiplication and distribution rights of public-domain seed to firms with the capacity to meet conditions.</p> <p><i>Rationale:</i> Region-wide low productivity drives up poultry prices, diminishes SPS concerns</p>	National seed agencies, seed multipliers, seed companies, national parliaments.	Low	Large Allowing public and proprietary seed to enter commercial channels is a precondition to increasing national-level productivity	Perceived threat by seed multipliers and national seed regulators	All ECOWAS countries except for Nigeria, which already has done this. 
<p><i>Intervention:</i> Harmonize national seed policies with the ECOWAS framework.</p> <p><i>Rationale:</i> Low maize productivity status in the region diminishes priority of phytosanitary issues</p>	National seed research and certification bodies, private seed multipliers, seed companies, customs and security services. The set of private stakeholders willing to advocate for national ratification of harmonized policy	Low Meetings	Large Liberalizing regional markets for improved seed is critical to the rapid expansion of maize productivity. A regional increase of 1.0 ton/ha. would convert the region from net-importer to net-exporter status.	Protectionism of national seed bodies Barriers to exports by countries trying prioritizing domestic demand.	ECOWAS wide. 

ANNEX I: LIST OF PERSONS MET

Table 12 - List of Persons Met or Interviewed in Nigeria

Location	Name	Title	Organization
Abuja	Dr Vincent Isegbe	Director	Nigeria Agricultural Quarantine Services
Abuja	Dr Adeleke M. A.	Maize Coordinator	Federal Ministry of Agriculture and Rural Development
Abuja	Olatokun	Director	National Agriculture Seed Council
Abuja	Dr. Adenola		Maize Association of Nigeria
Kaduna, Zaria	Professor Ogungbile		Premier Seed Nigeria, Ltd.
Kaduna	Dr. Kehinde		Monsanto Nigeria, Ltd.
Kaduna	Yusuf Salisu		Large scale maize farmers
Kaduna	Jamilu Muazu		Large scale maize farmers
Kaduna	AlHaji Amadu		Large scale maize farmers
Abuja	Dr. Gideon Mshelbwala	Chief Veterinary Officer	Federal Department of Veterinary and Pest Control Services
Abuja	Dr. Gidado M. Muhammed		Federal Department of Veterinary and Pest Control Services
Abuja	Majasan Ademola	Deputy Director	Federal Department of Veterinary and Pest Control Services
Abuja	John Toyin Taiwo	Deputy Director	Federal Department of Animal Production and Husbandry Services
Abuja	Bolaji Ibilade	Desk Officer (Sheep and Goat Value Chain)	Federal Department of Animal Production and Husbandry Services
Abuja	Dr. Akinjo Abiodun	Director	Nigeria Agricultural Quarantine Services
Abuja	Chris Nnamdi Onukwuba	Head, Department of Collaboration Planning and International Trade	Nigeria Agricultural Quarantine Services
Abuja	Obaje J. Abah	Assistant Director	Nigeria Agricultural Quarantine Services
Abuja	Dr. Vincent Isegbe	Co-Ordinating Director	Nigeria Agricultural Quarantine Services
Abuja	Abdul Lateef Ahammad	National President	National Sheep and Goat Development Association of Nigeria (Nashgodan)
Abuja	Akin F. Gbadamosi	Secretary General	Federation of Agricultural Commodity Associations of Nigeria

Abuja	John Olowokere	Public Relations Officer	National Sheep and Goat Development Association of Nigeria (Nashgodan)
Abuja	Rhys Owain	Director of Operations	Transcorp Hilton Abuja
Abuja	Aliyu Garba	Butcher	Karu Market
Abuja	Mafindi Isa Tafida	Executive Director	Halal Abattoirs - Famag-Jal Nigeria, Ltd.
Abuja	Dr. Bukar Ali Usman	Director	National Agency for Food and Drug Administration and Control (NAFDAQ)
Jos	Moses Odugbo	Director	National Veterinary Research Institute
Jos	Dr. Reuben A. Ocholi		National Veterinary Research Institute
Jos	Samuel Etop	Nutrition Specialist	Grand Cereals Limited
Jos	Alhaji Akuvo Ibrahim	Chief Secretary of Market	Yankaji Livebird Market
Jos	Ayuba Havuna	Veterinary Officer	Yankaji Livebird Market
Lagos	Beaconness C.O. Adedo	Poultry Trader	
Ogun State	Peter Akintola	Business Manager	Animal Care Lab
Shika-Zaria	Dr. OKUBANJO Yinka	Lecturer	Ahmadu Bello University - Faculty of Veterinary Medicine
Shika-Zaria	Professor C.A.M. Lakpini	C.E.O	National Animal Production Research Institute
Abuja	Baba Othman Ngelzarma	President	Miyetti Cattle Breeders Association
Kaduna	Professor Jonson Onyiben		National Agricultural Research, Extension and Liaising services
Kano			Dala Foods Nigeria, Ltd.
Garki, Abuja			Northern Commodities & Processors, Ltd.

Table 13 - List of Persons Met or Interviewed in Ghana

Location	Name	Title	Organization
Accra	Richard Chen	Private Sector/Team Leader of Economic Growth Office	USAID
Accra	Dr. Kenneth Gbeddy	Director	Ministry of Veterinary Services
Accra	Dr. Eugene M. Yelfaanibe	Deputy Director	Ministry of Veterinary Services
Accra	Mr. ARKORFUL Kwamina	Director	Animal Production Directorate
Accra		Deputy Director	Animal Production Directorate

Accra		Meat Department Clerk	Shoprite
Accra		Meat Department Head	Maxmart
Accra		Local Meatcutter	Nima Market in Accra
Achaiman		General Secretary	National Butchers and Meat Cutters Association
Achaiman		National President	National Butchers and Meat Cutters Association
Accra		National Chairman	Ghana Poultry Association
Achaiman	Alhaji Moro Akokode	National Chairman	Achaiman Market - Livestock Breeders and Traders
Achaiman	Cheik Issah Amante	Representative	Achaiman Market - Livestock Breeders and Traders
		Veterinary Surgeon/Director	La Veterinary Hospital
Kumasi		Managing Director	Kumasi Abattoir
Kumasi		Landlord	Kumasi Abattoir
Kumasi		Para-veterinary Officer	Kumasi Abattoir
Kumasi	Dominic Nzoley	Production Manager	Akate Farms
Kumasi	Ibrahim Issahak	Production Administrator	Akate Farms
Techiman	Wanye Emelia	Veterinary Officer	Municipal Agricultural Development Unit (MADU)
Bolgatanga			Bolgatanga Slaughterhouse
Paga	Dr. Clement Y. Adda	Deputy Director	Veterinary Services in Paga
Dakola	Menongou Judiciel	Veterinary Services Agent	Veterinary Services in Dakola
Accra	Eric Quaye	Head	Ghana Seed Inspection Division
Accra	Lawrence Alato		Pesticide and Fertilizer Regulatory Division, Plant Protection and Regulatory Services
Accra	John Opong Otoo	Focal Point	CODEX
Accra	Derry Dontoh		Mycotoxin Lab
Accra	Isabella M. Agra	Ag DCE	Food and Drugs Authority
Accra	Mr Opong	DCE	Food and Drugs Authority
Accra	Gideon Aboagye	Managing Director	Ghana Grains Council
Accra	Team of staff		West Africa Trade Hub
Accra	Janet A. Mensah	Cereal Desk Officer	Ministry of Food and Agriculture
Accra	G. Banini		Crop Budgets, Ministry of Food and Agriculture
Accra	E. K. Boamah	Agricultural Country Director	Ministry of Food and Agriculture
Accra	Angela Danson		D/Projects

Accra	William Kotei	General Manager	WIENCO
Kumasi	Gladys Sampson	General Manager	Premium Foods
Kumasi	Prince Andoh	Procurement/Admin Officer	Premium Foods
Kumasi	Stella Ama Ennin	Director	Crops Research Institute (CRI)
Kumasi	E. Otoo	Deputy Director	Crops Research Institute (CRI)
Kumasi	Minka Fordjour	RDA	Ashanti
Techiman	Maama James	MO	Extension
Techiman	Out Solomon	Technical officer	Veterinary Services Directorate
Techiman	Obiri Yeboah	Secretary	Maize Traders
Techiman	Ebenezer Ocansey	Silo Manager	NAFCO
Tehiman	Homidas	Director	MADU
Tamale	Malex Alebikiya	Executive Director	ACDEP
Tamale	Cornelius K.	Value Chain Manager	ACDEP
Tamale	Musah Alhassan		GUNDAW Warehouse
Tamale	Mashark Abdulai	Maize breeder	SARI
Accra	Philip Abayori		EC AMSG
Accra	Papa Kow Bartels	VCD	Ministry of Trade and Industry
Accra	Gifty Lamptey	Managing Director	SIDALCO
Tema	Prince Agyeman		CHEMICO LTD
Tema	Didier Gonsolin	Head of Agriculture Department	Louis Dreyfus
Tema	Stephen Tour	Agronomist	Louis Dreyfus
Accra	Sergio Godoy	Managing Director	Yara, Ltd.
Accra	Danquah Add-Yobo	Chief Financial Officer	Yara, Ltd.
Accra	N. Ramsinjavovo	Deputy Chief of Party	Ghana ADVANCE Project
Accra	Seydou Samake	Agricultural Resources SPS/Policy Advisor	USAID West Africa Trade Hub

Table 14 - List of Persons Met or Interviewed in Côte d'Ivoire

Location	Name	Title	Organization
Abidjan	GUI GUI Pythagore Legré Charles	Assistant	USAID
Abidjan	Moodi Cissé	Marchand de bétail emboucheur	Marchand/Emboucheur
Abidjan	Babou Landouré	Sécretaire général des marchands et courtiers	Association des marchands et courtiers
Abidjan	Acka Tano Abdoulaye	Chef du Marché à bétail d'Abidjan	Direction de l'Hygiène Alimentaire et des Abattoirs

Abidjan	Sakandé Ous mane	coutier (tuteur) au marché à bétail	marché de bétail de Port Bouet
Abidjan	KOUA Atto Sylvain	Président des éleveurs de petits ruminants	Association des éleveurs de petits ruminants
Abidjan	DIABY Karamoko	Président	Association des aviculteurs de Côte d'Ivoire
Abidjan	Ouattrà yélorsigué	Sécretaire Permanent	Interprofession avicole
Abidjan	BONI Roger	Sécretaire général	Filière Bétail viande
Abidjan	KONAN Kouadio	Trésorier Général	Filière Bétail viande
Abidjan	COULIBALY Salif	Président	Filière Bétail viande
Abidjan	NEZZI Nicole MBOUA	Sous Directeur de la sécurité Sanitaire	Direction des Services vétérinaires
Abidjan	FADIGA Haida Diarrassouba	Sous Directeur de l'Information zoosanitaire	Direction des Services vétérinaires
Abidjan	LOUKOU Konan	Responsable qualité	PROSUMA
Abidjan	COULIBALY	Point focal SPS	Ministère du commerce
Abidjan	Sebastien DOZ	Directeur technique	Solibra (Brasserie)
Abidjan	GANON Junior	Gérant	Jour de Marché (supermarché)
Ouangolodougou	DJA Kouassi	Directeur départemental	Ministère des Ressources Animales
Ouangolodougou	BOMA Diomandé	chef adjoint de poste de contrôle	poste vétérinaire aux frontières
Ouangolodougou	TUO Lokporo	Représentant de la société	société KDS
Ouangolodougou	BADINI Karim	Représentant de la société	SOCOCIB
Korhogo	SANOOGO Moussa	chef de laboratoire de Bouaké	LANADA
Korhogo	Traoré seidana Ibrahim	Chef du Laboratoire de Korhogo	LANADA
Korhogo	Toure Mamadou	Chef de Service	Direction régionale de Ministère des Ressources Animales
Korhogo	TRABI	Chef de bureau vente	Direction régionale de l'Agriculture
Agnibilékro	Coulibaly Lancina	Directeur départemental	Direction Départementale du Ministère des Ressources Animales
Agnibilékro	Dongo Kouabla Yacouba	Responsable du Contrôle phytosanitaire	Direction Départementale de l'Agriculture
Agnibilékro	Ouattara Moussa	Directeur technique	Société FOANI
Takikro	Soro Brahim	chef de poste	Contrôle vétérinaire aux frontières
Takikro	Miessan Denis	inspecteur phytosanitaire	Contrôle phytosanitaire aux frontières
Abidjan	KOFFI Pacôme	Chef de Service	Service de Contrôle Sanitaire et Vétérinaire aux frontières

Abidjan	Marius Comoé	Président	Fédération des Associations de Consommateurs de Côte d'Ivoire
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Table 15 - List of Persons Met or Interviewed in Burkina Faso

Location	Name	Title	Organization
Ouagadougou	BOYNA Boukary	Secrétaire Association marché à Bétail, petits ruminants	Secrétaire Association marché à Bétail, petits ruminants
Ouagadougou	SOME Mariam	responsable quarantaine	Direction de la Protection des Végétaux et du Conditionnement (DPVC)
Ouagadougou	OUEDRAOGO Dieudonné	responsable des pesticide et contrôle	Direction de la Protection des Végétaux et du Conditionnement (DPVC)
Ouagadougou	SAWADOGO Timbila Thomas	Secrétaire Permanent	Confédération des Fédérations Nationales de la Filière Bétail-Viande de l'Afrique de l'Ouest (COFENABVI-AO)
Ouagadougou	SANOU Dossoun	Vice Président	Union Nationale des Producteurs du Bétail et de la Viande du Burkina Faso (UNAPRO-BVI)
Ouagadougou	NOUGTARA Boukari	Président Directeur Général	Charcuterie Moderne
Ouagadougou	BIEGO Samssonna	Directeur Général	Central de Transformation de Produit Agricoles (CTRAPA)
Ouagadougou	NIKIEMA Anatole	Directeur Général Adjoint	Société Industrielle de l'Afrique de l'Ouest (SIMAO)
Ouagadougou	COULIBALY SIE Seydou	Président	Association Professionnelle des Organisations de la Filière Avicole Moderne du Burkina Faso (APOFAM-BF)
Niangoloko	DIARRA LOMPO Céline	inspectrice phytosanitaire	Direction de la Protection des Végétaux et du Conditionnement (DPVC)/Poste
Niangoloko	DIABATE Souleymane	Chef de Poste phyto	Direction de la Protection des Végétaux et du Conditionnement (DPVC)/Poste
Niangoloko	DAYO Jean Clément	Adjoint Chef de Poste Vétérinaire	Direction de la Santé publique Vétérinaire et de la Législation/Poste
Ouangolo	Equipe consultants Côte D'Ivoire		
Bobo-Dioulasso	KOURA Dofinita	Chef Service Santé Animale, Conseiller d'Elevage	Direction Régionale des Ressources Animales et Halieutiques des Hauts Bassins

Bobo-Dioulasso	SANOGO F. Y. Emile	Technicien Supérieur d'Elevage	Direction Régionale des Ressources Animales et Halieutiques des Hauts Bassins
Bobo-Dioulasso	ROUAMBA R. Constant	Docteur Vétérinaire	Direction Régionale des Ressources Animales et Halieutiques des Hauts Bassins
Bobo-Dioulasso	HARO Jean	Directeur Régional	Direction Régionale des Ressources Animales et Halieutiques des Hauts Bassins
Bobo-Dioulasso	SANOUE Pierre Innocent	Directeur Général	Abattoir Frigorifique de Bobo
Bobo-Dioulasso	SANOUE Soumaila	Président	Comité Interprofessionnel des Céréales et du Niébé (CIC-B)
Bobo-Dioulasso	SANOUE Saïdou	Chargé gestion magasin, Responsable Enquetes sur les flux frontaliers	Comité Interprofessionnel des Céréales et du Niébé (CIC-B)
Bobo-Dioulasso	SANOUE Seydou	Animateur principal	Union Provinciale Professionnels Agricoles du Houet (UPPAH)/CIC-BIC-B)
Bobo-Dioulasso	SAYOGO Moussa	Président	Groupement des éleveurs vendeurs, et exportateurs de volaille de Bobo Dioulasso (GEVEVOB)
Ouagadougou	TANGONGOSSE S.I.M Yamine	Président	Association des Grossistes et Détaillants d'Intrants Agricoles (AGRODIA)
Ouagadougou	CONGO A. Marius	Gestionnaire Comptable	Association des Grossistes et Détaillants d'Intrants Agricoles (AGRODIA)
Ouagadougou	SANOUE A. Alphonse	Chargé des Intrants	Association des Grossistes et Détaillants d'Intrants Agricoles (AGRODIA)
Ouagadougou	Shawn Wozniak	Chargé d'agriculture	USAID/Embassade des USA
Ouagadougou	Dr OUATTARA Lassina	Directeur général de NAFASO et Président de UNPSB	Direction Générale de la Santé Animale
Ouagadougou	Dr SAWADOGO Joseph	Directeur	Direction de la Santé Animale
Ouagadougou	Dr COMPAORE MINOUNGOU L. Germaine	Directrice	Laboratoire Nationale d'Elevage
Ouagadougou	SANOUE Hilaire	Chargé de Sécurité sanitaire des végétaux	Union Economique et Monétaire Ouest Africaine (UEMOA)
Ouagadougou	DOMAGNI Kouadjo Théodore	Chargé des Ressources Animales	Union Economique et Monétaire Ouest Africaine (UEMOA)
Ouagadougou	NDIAYE Sidi	Chargé des Productions Animales	Union Economique et Monétaire Ouest Africaine (UEMOA)
Ouagadougou	ZONGO Gilbert	Chargé d'agriculture	Union Economique et Monétaire Ouest Africaine (UEMOA)

Ouagadougou	SAWADOGO Abdoulaye	Directeur général de NAFASO et Président de UNPSB	Neema Agricole du Faso, Union Nationale des Producteurs Semenciers du Burkina
Ouagadougou	KOLGA Issaka	Directeur Régional	Faso Agriculture et Intrants (FAGRI)
Ouagadougou	Dr MAIGA Adama	Directeur	Direction de la Santé publique Vétérinaire et de la Législation
Ouagadougou	Mr THIOMBIANO Joel	Agent technique d'Elevage	Poste vétérinaire de la Gare Internationale de ouaga (routière)
Ouagadougou	BARRO Bakary	Directeur marketing	Marina market
Ouagadougou	OUATTARA Moussa	Directeur	Direction de la Protection des Végétaux et du Conditionnement
Ouagadougou	AKLAMAVO Yves G.	Coordonnateur	P4P Programme Alimentaire mondial (PAM)
Ouagadougou	OUEDRAOGO Hamidou	Directeur général de NAFASO et Président de UNPSB	Meunerie et Légumes Secs (MELS)
Ouagadougou	SAWADOGO Alexandre	Sécretaire Général	Ministère des Ressources Animales et Halieutiques (MRAH)
Ouagadougou	KARAMA B. Jean Paul	Directeur de la Normalisation et de la Certification	Agence Burkinabé de Normalisation, de la Métrologie et de la Qualité (ABNORM)
Ouagadougou	OUEDRAOGO Adama	Directeur général de NAFASO et Président de UNPSB	Société de Fabrique d'Aliments pour Bétail (SOFAB)
Ouagadougou	KARA Marcel	Chef de Poste phyto Ouaga Gare de train	Protection des Végétaux et Conditionnement
Ouagadougou	DIENI David	Inspecteur phytosanitaire	Protection des Végétaux et Conditionnement
Ouagadougou	SAWADOGO Abdoulaye	Directeur Commercial par Intérim	Société Nationale de Gestion des Stocks de Sécurité (SONAGESS)
Ouagadougou	Bani/Cessouma Djénéba	Contrôle phyto-sanitaire	Direction Protection des Végétaux/Poste phyto Gare internationale de Ouaga (routière)
Ouagadougou	ILBOUDO/OUEDRAOGO Franceline	Contrôle phyto-sanitaire	Direction Protection des Végétaux/Poste phyto Gare internationale de Ouaga (routière)
Bobo-Dioulasso	DIALLO Oumou/TRAORE	Présidente Nationale	Association Afrique Agro-Export
Bobo-Dioulasso	OUEDRAOGO Salam	Directeur	Manuly Agrobusiness et hydrolic

Table 16 - List of Persons Met or Interviewed in Mali

Location	Name	Title	Organization
Bamako	Seydou Sanogo	Chef division legislation et controle phytosanitaire	National Directorate of Agriculture
Bamako	DRISSA Colibaly	Veterinary doctor, chef division inspection et sante publique veterinaire, point national d'information des mesures SPS	National Directorate of Veterinary Services
Bamako	Cisse Berthe Alimata	Head of quality control service	Veterinary Central Laboratory
Bamako	Boubacar Madio dib Aladiogo Maiga	Head of toxicology laboratory and environmental quality control	Veterinary Central Laboratory
Bamako	Daniel Simeon Kelema	Secetaire general du Ministere	Ministry of Agriculture
Bamako	Dr. Mahammadou Sako	Acting Head	National Agency for Food Security and Safety
Bamako	Sekouba Keita	Head of Food Safety Department	National Agency for Food Security and Safety

ANNEX II: NATIONAL SPS REGULATORY BODIES

Regulatory sphere	Ghana	Nigeria	Côte d'Ivoire	Burkina Faso
Food safety	<p>Food and Drugs Authority (Ministry of Health)</p> <ul style="list-style-type: none"> - policy advice on measures to protect the health of consumers with respect to food and drugs placed on the market - control of import and export of processed food and drugs - facilitation of development of standards for food and drugs - monitoring through the metropolitan, municipal, and district assemblies and other agencies of compliance with the Food and Drug Law 	<p>National Agency for Food and Drug Administration and Control (NAFDAC) [ISO registered]</p> <ul style="list-style-type: none"> - control of processed and packaged products to ensure food safety inspection and enforcement - promotion and enforcement of international global standards for food and drugs to register products - approval of laboratories for all forms of testing of toxins, residues, etc. to ensure SPS measures are implemented - collaboration with VCN to give approval for the importation of veterinary pharmaceuticals (Any company planning to produce or import veterinary products must have a licensed registered veterinary surgeon who will be the professional responsible for the registration of the veterinary premises.) - Nigerian Agricultural Quarantine Service (NAQS) issues an SPS certificate, while 	<p>Agence Nationale de Sécurité Sanitaire des Aliments en Côte d'Ivoire (Prime Minister's Office: centralized structure for risk management)</p> <ul style="list-style-type: none"> - consumer protection - improved sanitary monitoring of food - evaluation of SPS risk - multi-sector coordination of official monitoring, in collaboration with various ministry departments and relevant bodies - coordination of elaboration, execution, and monitoring of national food-safety regulations <p>Direction chargée de la Sécurité alimentaire (Ministry of Agriculture)</p> <ul style="list-style-type: none"> - secretariat for the national Codex Alimentarius committee <p>Ministère du Commerce</p> <ul style="list-style-type: none"> - secretariat for the WTO's SPS committee <p>Direction des Services vétérinaires (DSV) (Ministry of Animal and Fishery Resources)</p> <ul style="list-style-type: none"> - mortem abattoir post-meat examinations 	<p>Inspection de la Qualité et de la Métrologie (Ministry of Trade and Handicrafts)</p> <p>Direction de la Protection des Végétaux et du Conditionnement (Ministry of Agriculture's Director-General for Crop Production)</p> <p>Direction Générale des Services Vétérinaires (DGSV), (Ministry of Livestock and Fisheries)</p> <p>Direction de l'Action Sanitaire (DAS) placée sous la tutelle des Communes urbaines</p> <p>Direction Générale de la Santé Publique (DGSP), (Ministry of Health)</p>

Table of Regulatory Bodies Cont.

Regulatory sphere	Ghana	Nigeria	Côte d'Ivoire	Burkina Faso
		NAFDAC provides certificate of health.	<ul style="list-style-type: none"> - export and import inspections for meat and meat products Institut National d'Hygiène Publique (INHP) (Ministry of Health) <ul style="list-style-type: none"> - various analyses and safety controls 	Laboratoire National de Santé Publique (LNSP), (Ministry of Health)
Plant protection and regulation	Plant Protection and Regulatory Services Department (Ministry of Food and Agriculture) <ul style="list-style-type: none"> - designated National Plant Protection Organization (NPPO) as required by the International Plant Protection Convention (IPPC). - policy advice on plant protection and regulatory services. - plant quarantine and phytosanitary services, and import/export certification - seed inspection and certification services - fertilizer and pesticide regulatory services - disease and pest management, including biological control and migratory pests. 		Direction de la Protection des Végétaux, du Contrôle et de la Qualité (DPVCQ) (Ministry of l'Agriculture, the official National Plant Protection Organization as required by the IPPC. <ul style="list-style-type: none"> - drafting plant-protection policies and regulations for pest and disease control - monitoring quality of foodstuffs of plant origin domestically and at import/export - campaigning against crop pests - approval and management of pesticides - management of phytosanitary agreements Sous-direction des Semences et Plants (Ministry of Agriculture) <ul style="list-style-type: none"> - policy for seeds and propagating material - monitoring quality and certification of seeds and propagating material - approval and management of fertilizer Comité Pesticides de Côte d'Ivoire (Ministry of Agriculture), an inter-ministerial committee under the chairmanship	Direction de la Protection des Végétaux et du Conditionnement (Ministry of Agriculture's Directorate-General for Crop Production) <ul style="list-style-type: none"> - processing and packaging - quality - fraud detection and prevention - monitoring quality standards of non-animal food products - phytosanitary and quality control Laboratoire national de Santé publique (Ministry of Health) duplicates some of DPVC's functions. In addition to its role as the country's reference laboratory, LNSP has assumed responsibility for monitoring the quality of multiple products, including food.

Table of Regulatory Bodies Cont.

Regulatory sphere	Ghana	Nigeria	Côte d'Ivoire	Burkina Faso
			<p>of the Minister of Agriculture</p> <ul style="list-style-type: none"> - regulation of manufacturing, sale, and use of pesticides. <p>Directions régionales de l'Agriculture (Ministry of Agriculture)</p> <ul style="list-style-type: none"> - pesticide monitoring - phytosanitary and food safety inspection 	
<p>Standards and certification</p>	<p>Ghana Standards Authority (Ministry of Trade and Industry)</p> <ul style="list-style-type: none"> - development of standards to ensure high-quality goods and services - standardization in industry and commerce - public and industrial welfare, health, and safety - secretariat for national Codex Committee 	<p>Standards Organization of Nigeria (SON):</p> <ul style="list-style-type: none"> - setting standards for raw materials for feed for feed millers - Coordination with NAFDAC, health ministry, agriculture ministry, trade ministry to ensure compliance with the Codex Alimentarius Commission standards. <p>They have standard laboratories for the testing of heavy metals.</p>	<p>Côte d'Ivoire normalization (CODINORM) (National standards and certification association, managed by the private sector, accountable to the Ministry of Industry)</p> <ul style="list-style-type: none"> - promotion of management of quality - information and documentation - elaboration of norms of agricultural, food, and other products - ensuring certification of firms and production systems - training and support to accreditation - representing Côte d'Ivoire at meetings of regional and international standards bodies 	<p>L'Inspection générale des Affaires économiques (Ministry of Trade and Handicrafts)</p> <ul style="list-style-type: none"> - processing and packaging - quality - fraud detection and prevention <p>Inspection de la Qualité et de la Métrologie (Ministry of Trade)</p> <ul style="list-style-type: none"> - compliance checks <p>Agence Burkinabé de Normalisation, de la Métrologie et de la Qualité (Agence de Promotion des Exportations)</p> <ul style="list-style-type: none"> - development of national quality norms - certification relative to national norms - promotion of firms' quality management - certification of ISO 9001 norms <p>Direction des Normes, Qualités et Métrologie</p>

Table of Regulatory Bodies Cont.

Regulatory sphere	Ghana	Nigeria	Côte d'Ivoire	Burkina Faso
				<p>agricoles (Ministry of Agriculture's Directorate-General for Rural Economic Promotion</p> <ul style="list-style-type: none"> - capacity building for firms to meet SPS and TBT rules - development of strategies to counter SPS and TBT problems
<p>Regulation of animal products</p>	<p>Veterinary Services Directorate (Ministry of Food and Agriculture)</p> <ul style="list-style-type: none"> - surveillance and management of animal diseases - regulation of abattoirs and meat processing facilities - meat inspection 	<p>Federal Department of Veterinary and Pest Control Services (FDVPC).</p> <ul style="list-style-type: none"> - formulation of policies on animal disease control - issuance of veterinary health certificates for ex/import of live animals 	<p>Direction des services vétérinaires (DSV) (Ministry of Animal and Fishery Resources)</p> <ul style="list-style-type: none"> - epidemiological monitoring of animal disease - sanitary monitoring of products of animal origin destined for domestic consumption or for export - oversight of distribution of veterinary medicines - sanitary approval of firms dealing with and transforming meat 	<p>Direction Générale des Services vétérinaires (Ministry of Livestock and Fisheries)</p> <ul style="list-style-type: none"> - monitoring quality standards of animal-based food products <p>Laboratoire national de Santé publique (Ministry of Health) duplicates some of DGSV's functions. In addition to its role as the country's reference laboratory, LNSP has assumed responsibility for monitoring the quality of multiple products, including food.</p> <p>Direction de la Santé animale (Ministry of Livestock and Fisheries)</p> <ul style="list-style-type: none"> - monitoring of the health of imported, slaughtered, and traded meat <p>Direction Générale de la Santé</p>

Table of Regulatory Bodies Cont.

Regulatory sphere	Ghana	Nigeria	Côte d'Ivoire	Burkina Faso
				<p>publique, DGSP (Ministry of Health) Laboratoire National de Santé publique (Ministry of Health) duplicates some of DGSP's functions. In addition to its role as the country's reference laboratory, LNSP has assumed responsibility for monitoring the quality of multiple products, including food.</p>
<p>Veterinary regulation</p>	<p>Veterinary Council (Ministry of Food and Agriculture). <ul style="list-style-type: none"> - regulation of the veterinary profession </p>	<p>Veterinary Council of Nigeria (VCN) regulates the quality of teaching and practice of veterinary medicine in Nigeria. <ul style="list-style-type: none"> regulation of the veterinary surgeons' training institution registration of qualified veterinarians to practice monitoring attendance at continuing education seminars Enforcement of discipline among veterinarians </p>	<p>Ordre national des Vétérinaires de Côte d'Ivoire (ONVC, professional association) <ul style="list-style-type: none"> - promotion and monitoring of veterinary code of practice </p>	<p>Ordre National des Vétérinaire du Burkina Faso Direction de la Santé Publique Vétérinaire et de la Législation (DSPVL)</p>
<p>Decentralized SPS functions</p>	<p>Metropolitan, Municipal and District Assemblies (Ministry of Local Government and Rural Development) <ul style="list-style-type: none"> - inspection of meat, fish, vegetables, and other foods - supervision and control of abattoirs & ponds - prevention and control of animal diseases </p>		<p>Union des villes et Communes de Côte d'Ivoire and local authorities, overseen by the Ministry of Internal Affairs, with each local authority having its own inspection service <ul style="list-style-type: none"> - construction and management of abattoirs and livestock markets - inspection and monitoring of foods </p>	<p>Direction de l'Action sanitaire (Ministry of Livestock and Fisheries) <ul style="list-style-type: none"> - animal health monitoring in livestock markets and restaurants (operating under the control of urban administrations) </p>

Table of Regulatory Bodies Cont.

Regulatory sphere	Ghana	Nigeria	Côte d'Ivoire	Burkina Faso
Biosecurity				<p>L'Agence nationale de Biosécurité (Ministry of Higher Education, Scientific Research, and Innovation)</p> <ul style="list-style-type: none"> - scrutiny of requests to import and market GMO commodities and products - inspections and technical audits of laboratories undertaking GMO research

ANNEX III: OIE (LIST OF ANIMAL PESTS, TOXINS, RESIDUES, AND DISEASES COVERED)

Cattle

Contagious bovine pleuro-pneumonia (CBPP), bovine tuberculosis, bovine brucellosis, streptothricosis, foot rot, anthrax, blackleg, hemorrhagic septicemia. The disease priorities are CBPP and zoonotic diseases like tuberculosis.

Contagious Bovine Pleuro-Pneumonia (CBPP):

- A serious, slow-moving bacterium that attacks the lungs and pleura and causes severe respiratory disease. Symptoms include anorexia, fever, and respiratory symptoms such as dyspnea, cough, and nasal discharges. Due to the slow-acting nature of the disease, few clinical symptoms may be obvious at the outset, making early recognition difficult.
- CBPP commonly spreads by inhaling an animal's cough, or through direct contact with saliva, urine, or reproductive tissues, or fluids of infected animals.
- The disease develops slowly within an animal, which means that more animals can be exposed before it is caught. Morbidity and mortality can be high, and it may take many months for infection to spread among animals in a herd.
- CBPP does not affect humans.

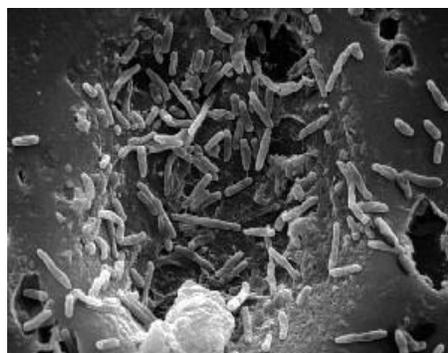
Photo 1 - Contagious Bovine Pleuro-Pneumonia (CBPP)



Bovine Tuberculosis

- A chronic bacterial disease of cattle
- The disease typically spreads by the inhalation of an infected animal's cough, ingestion of unpasteurized milk, or contact with feces and reproductive secretions.
- Early symptoms are often mistaken for other less fatal lung diseases.
- Bovine tuberculosis is still common in West Africa and severe economic losses can occur from livestock deaths, chronic disease, and trade restrictions.
- Humans can contract the disease.

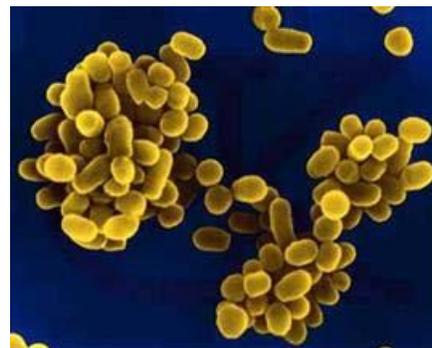
Photo 2 - Bovine Tuberculosis



Bovine Brucellosis

- Also known as the “contagious abortion disease,” this bacterial disease causes reproductive problems such as abortions, stillbirths, or infertility. The bacteria *B. abortus* causes the disease.
- The disease is spread from infected cattle to offspring through exposure to reproductive fluids (such as the placenta, fetus, fetal fluids, and vaginal discharges), or through ingestion of contaminated dairy products. Some cattle can become carriers but show no signs or symptoms.
- In humans, brucellosis can be a serious, debilitating, and sometimes chronic disease that may affect a variety of organs. Humans contract brucellosis through drinking infected milk.

Photo 3 - Bovine Brucellosis



Dermatophilosis (Streptothricosis)

- Also known as “lumpy wool” or “strawberry foot rot,” the bacterium *Dermatophilus congolensis* causes this disease.
- The disease spreads through direct contact with the infected skin, or through biting insects. Humans can also spread the disease by carrying the bacteria on their clothes. Early signs of infection include a matting of hair, which soon leads to scabs, normally found on the neck and heads.
- If exposed to infected animals, humans can develop pustules (small, pus or fluid-filled bumps) on the hands and arms that are not painful. However, the sores will later break down to form shallow red ulcers that heal and leave scars.

Photo 4 - Dermatophilosis (Streptothricosis)



Source: University of Florida

Dermatophilosis (“Foot Rot”)

- Highly contagious bacterial skin disease caused by a number of bacteria, most commonly *Fusobacterium necrophorum*.
- The disease causes the deterioration of the tissue between the toes of ruminants and spreads through direct contact with infected skin or through certain insect bites. Outbreaks occur most often during the warm, rainy season.
- The first sign of the disease is lameness, with additional signs of lesions and a distinct odor. If foot rot is not caught, it may invade deeper structures of the foot, including joints, potentially leading to septic arthritis.
- Treatment is to clean, debride, and disinfect the infection, along with antibiotics.
- Infections in humans are rare; however, repeated contact to infected areas can cause sores and scarring.

Photo 5 - Dermatophilosis (“Foot Rot”)



Anthrax

- Disease caused by the spore-forming bacteria *Bacillus anthracis*, which grows on contact with oxygen and is extremely resilient.
- The bacterium can lie dormant for years in soil, or on the skin or wool of an infected animal. Insects carry the bacteria from an infected animal.
- The bacterium is found worldwide, except for Antarctica, with certain areas being more susceptible to sudden, devastating outbreaks. The disease affects ruminant animals and horses, which are often found dead with little to no signs of prior illness.
- Health effects on humans vary depending on the cause of contraction. However, if the disease is not caught in time, it eventually causes death. Skin infections through cuts or open wounds when handling infected meat, skin, or fur lead to localized infections that will spread if not caught, while consumption of infected meats causes gradually worsening intestinal issues.
- Transmission can happen in three forms: consumption of infected meats; through contact with the skin, such as when handling infected animals or working with skin/fur products of infected animals; and inhalation of the spores, which is the rarest but deadliest form of infection.

Photo 6 - Anthrax



Source: FAO

Small Ruminants

Peste de Petit Ruminants (PPR), Foot-and-Mouth Disease, Helminthiasis, etc. The priority disease for control is PPR.

Peste de Petits Ruminants (PPR)

- Virus most commonly affecting sheep and goats, geographically in the northern tropics. Spreads through the tears, coughing, sneezing, and feces of infected animals.
- Common symptoms in animals include depression, fever, secretions from the eyes and nose, mouth sores, coughing, diarrhea, and death.
- Often confused with similar diseases, like foot-and-mouth disease.
- Best controlled through quarantine, restriction of movement, and focused vaccination of the vulnerable region.
- The virus does not affect humans.

Photo 7 - Peste de Petits Ruminants (PPR)



Source: FAO

Foot-and-Mouth Disease (FMD)

- Symptoms include fever and sores in the mouth and on feet.
- FMD spreads through direct contact with bodily fluids of infected animals or ingestion of infected animal by-products (meat, milk).
- Humans can also spread the disease by carrying the virus on their clothes or skin.
- Often confused with other similar diseases, so clinical confirmation of the disease is necessary.
- FMD tends to be mild in sheep and goats.
- Different strains of the virus prevent vaccination from being an extremely effective method of prevention.

Photo 8 - Foot-and-Mouth Disease (FMD)



Source: <http://www.cfsph.iastate.edu/>

Helminthiasis

- Infestation with one or more intestinal parasitic worms—roundworms, whipworms, hookworms.
- Transferred through contact with infected feces or penetration of the skin by infective larvae in the soil (hookworms).
- Human infection is common in areas with poor sanitation.
- Control based on drug treatment, improved sanitation, and health education.

Photo 9 - Helminthiasis



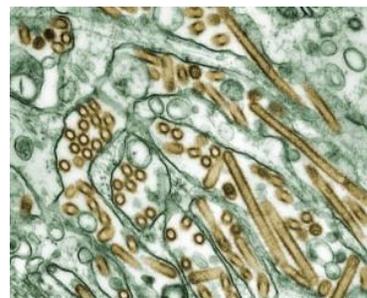
Source: Outbreaknewstoday.com

POULTRY

Avian Influenza (AI): Avian Influenza, or bird flu, is an infectious viral illness. In rare cases, it can affect humans.

- The subtype H5N1 is highly pathogenic and spread quickly in West Africa.
- Infected birds can shed AI in their saliva, nasal secretions, and feces. Infection occurs through exposure to these sheddings.
- The primary risk factor for human infection appears to be direct or indirect exposure to infected live or dead poultry or contaminated environments, such as live-bird markets.

Photo 10- Avian Influenza



Source: omiconline.org

Newcastle Disease

- A highly contagious viral infection that affects many species of domestic and wild birds.
- Can result in digestive, respiratory and/or nervous clinical signs, which range from a mild, unremarkable respiratory disease to very severe depression, drop in egg production, increased respiration, profuse diarrhea followed by collapse, or long-term nervous signs (such as twisted necks).
- The disease spreads through direct physical contact with infected or diseased birds. The virus is present in manure and is breathed out into the air. Other sources of infection are contaminated equipment, carcasses, water, food, and clothing. People can easily carry the virus from one shed or farm to another. (Poultry Hub n.d.)

Photo 11 - Newcastle Disease



Source: Poultryhub.com

ANNEX IV: MAIZE PESTS AND DISEASES

PRE-HARVEST PESTS

Armyworm (*Spodoptera exempta*)

- African armyworm is the larval (caterpillar) stage of the night flying moth, *Spodoptera exempta*.
- The armyworm can consume maize faster than 400 head of cattle per hectare.¹

Photo 12 - Armyworm



Stem borers: African stem borer (*Busseola fusca*, pink stem borer, *Sesamia calamistis*; and the sugarcane borer, *Eldana saccharina*)

- Indigenous to and occurs throughout mainland sub-Saharan Africa.
- *Busseola fusca* and the pink stem borer (*Sesamia calamistis*) are similar in biology and morphology but can usually be distinguished in the adult stages.
- In West Africa, *B. fusca* is abundant in the dryer savanna zone, particularly in areas where sorghum grows (Harris, 1962).
- *Sesamia calamistis* occurs throughout sub-Saharan Africa, but is only a serious pest of cultivated cereals in West Africa (Bosque-Perez and Mareck 1990).
- *Eldana saccharina* (Pyralidae) is a pest that affects maize and sugarcane in West Africa, and occurs throughout sub-Saharan Africa (Moyal 1988, Scheibelreiter 1980, Bosque-Perez and Mareck 1990).

Photo 13 - African Stem borer Larvae



Source: Akol, M. Anne, BIONet Keys and Fact Sheets

Photo 14 - Adult Stem borer Moth



Source: Akol, M. Anne, BIONet Keys and Fact Sheets

Maize streak virus (MSV)

- Insect carried and endemic in sub-Saharan Africa.
- Causes sporadic maize streak disease that produces epidemics throughout the maize-growing regions of Africa.
- Transmitted by a common leafhopper, *Cicadulina mbila* Naude, but other leafhopper species, such as *C. storeyi*, *C. arachidis*, and *C. dabrowski*, are also able to transmit the virus (see below).
- Difficult to control and causes high yield losses when infections are severe, particularly for subsistence farmers.
- Opatampa, Ghana's principal maize variety and an open-pollinated variety, is MSV tolerant.

Photo 15 - Maize leafhopper



Source: www.safariyako.com

Striga (witchweed)

- Striga is a parasitic weed that robs maize, sorghum, and millet of essential nutrients.
- Three species cause the most damage: *Striga asiatica*, *S. gesnerioides*, and *S. hermonthica*.
- Striga-resistant hybrids and herbicides have been developed.
- Striga disproportionately affects smallholder farmers due to diminished access to resistant seed and herbicide.
- The plant lifecycle, which mostly occurs underground, complicates striga management.
- Forty percent of sub-Saharan fields may be infected.
- Estimated loss in crop value is \$13 billion.¹⁴

Photo 16 - Striga



Source: <https://www.researchgate.net/figure/270511013>

¹⁴ "Purple Witchweed." Infonet-biovision. N.p., 14 Sep 2009. Web. 7 Dec 2010. <<http://www.infonet-biovision.org/default/ct/112/pests>>.

Ear rot (*Aspergillus flavus*)

- The second most common *Aspergillus* mold and responsible for aflatoxin.
- Toxic to livestock and humans, both as a carcinogen and a cause of environmental enteric dysfunction (EED), the principal cause of stunting in humans and reduced productivity in livestock.
- Lives in soil and infects maize crop.
- Thrives in moist environments but can survive at moisture levels as low as 15 percent; can also infect stored maize (see below).
- Can be managed through the inoculation of non-toxic molds in the soil using IITA-developed *Aflasafe*, which requires modification to local environments.
- Of the four countries in this study, *Aflasafe* is only commercially available in Nigeria.

Photo 17 - Maize Ear Rot

Figure : Maize Ear rot (*Aspergillus flavus*)



Source: <http://www.corntoxins.org>

Maize Lethal Necrosis (MLN) disease (Sugarcane Mosaic virus + Maize chlorotic mottle virus)

- Result of a combination of two viruses, the Maize Chlorotic Mottle Virus (MCMoV) and any of the cereal viruses in the Potyviridae group, like the Sugarcane Mosaic Virus (SCMV), Wheat Streak Mosaic Virus (WSMV), or Maize Dwarf Mosaic Virus (MDMV).
- MLN causes secondary fungal infection in maize ears, which humans and animals should not consume.
- Discovered in East Africa in 2012; the U.S. in 1976; and became endemic in North and South America during the 1980s; now endemic in East Africa.
- Causes plant death (necrosis), leading to economic losses and food insecurity.
- Maize thrips, rootworms, and leaf beetles are common disease vectors, but grain-to-grain infection from transported grain also occurs.
- MLN is more prevalent where maize is continuously cropped.
- Contributes to increased mycotoxin levels.
- Presence undetected in West Africa.
- Concerns for possible contamination from regional maize trade, as well as contamination from transport vehicles entering ECOWAS member states from Sudan, South Sudan, and Chad.

Photo 18 - Maize Lethal Necrosis



Source: www.monitor.co.ug

POST-HARVEST PESTS

Larger Grain Borer (LGB) (*Prostephanus truncatus*)

- Attacks stored maize grains.
- Both the adults and the larvae (grubs) of these beetles feed on the grains.
- Introduced into Africa in the 1970s from South America.
- Adults come from infested cobs in the field or from an infested maize store and lay eggs in the grains.
- They attack maize both in the field and after harvest.
- Maize grains attacked by LGB lose the majority of their contents and are not fit to eat.
- Spreads rapidly in trade from source to infect crops near destination markets.
- Mitigation strategies include pheromone traps, Phostoxin (aluminum phosphide), and biological controls using *Teretrius* (formerly *Teretriosoma*) *nigrescens*.

Photo 19 - Larger Grain Borer (LGB)



Source: <http://www.infonet-biovision.org>

Greater Grain Weevil (*Sitophilus spp*)

- Consumes maize in larval and adult form.
- Adult female lays 300–400 eggs, one per maize grain.
- Reduces germination rate of poorly stored seed by as much as 90 percent.¹⁵
- Spread most rapidly through trade.
- Traditional smallholder storage of unshucked cob is an ideal environment for this pest to spread.
- Best controlled through the timely transfer of maize from the farm to storage facilities treated with Phostoxin.

Photo 20 - Greater Grain Weevil



Source: USDA/Agricultural Research Service

¹⁵ Santos, J.P., Maia, J.D.G and Cruz, I. (1990). Damage to germination of seed corn caused by maize weevil (*Sitophilus zeamais*) and Angoumois grain moth (*Sitotroga cerealella*). *Pesquisa Agropecuaria Brasileira*. 25: 12, 1687-1692.

Storage Molds (*Aspergillus flavus*)

(See the description of *Aspergillus flavus* in the Pre-harvest Pests section above.)

Lesser Grain Borer (*Rhyzopertha dominica*)

- Consumes maize in larval and adult forms.
- A female lesser grain borer deposits her eggs in clusters of two to 30 on kernels. Newly hatched larvae chew into kernels and complete their entire development there.
- Four larval stages. Development from egg to adult requires about 25 days under ideal conditions of 93 degrees F and 12 percent moisture (able to thrive in well-dried grain).
- Larvae and adults produce a large amount of waste. Larval fecal pellets can accumulate in large volumes in stored grain. The adults have wings and may fly to spread infestations.
- Also spread through trade.
- Best controlled through the timely transfer of maize from the farm to storage facilities treated with Phostox.

Photo 21 - Lesser Grain Borer



Source: <http://www.uniprot.org>

Key Takeaway

The recently identified causal link between aflatoxin exposure and infant and child stunting will elevate aflatoxin control as a political priority and suggests stronger agency collaboration between agriculture and maternal and child health (MCH).

ANNEX V: MAIZE—FUNCTIONS, INSTITUTIONS & ACTORS

Please note that the red stars designate the SPS hazard spots along the value chain.

PRODUCTION

Assuming that as maize farms grow in size and hold a similar mix in other crops, their access to productivity-enhancing resources will also increase. As agricultural value added per worker increases, we would expect farm size to increase. Agricultural value added per worker is a more accurate measure of producer access to labor saving technologies than farm size. Both Côte d'Ivoire and Nigeria have a higher percentage of agricultural products produced by better-resourced and larger commercial farms than do Ghana or Burkina Faso.

Photo 22 - Smallholder maize farmers in Nigeria



★ **Small holder farmers** dominate agricultural production in all four of the study countries with slight variation in the percentage of the population dependent on agriculture and the number of commercial scale farms (greater than 40 ha.) While the average farm size held by smallholders varies by country, there are also generalities that hold across national boundaries unless supported by remittances, government, or NGO programs. These include an inability (income constraint) or unwillingness (risk constraint) to pre-finance the cost of inputs, lack of access to quality hybrid seed, low productivity, and low household incomes resulting from the other constraints. Smallholder farmers tend to produce multiple crops in a season as a risk mitigation strategy. Smallholder farmers primarily grow principal crops for household consumption due to very low productivity, whereas they grow horticultural crops for cash. Smallholder farms have reduced access to mechanized cultivation and harvest technologies, though a recent expansion of tractor services has resulted in an increase of smallholders who access plowing services. Smallholders face reduced access to production and/or marketing credit, and except for those operating within irrigated perimeters, depend upon rain-fed agriculture.

★ **SPS hazard:** From an SPS perspective, smallholder farmers pose a significant SPS risk. Their diminished access to capital to purchase productive resources extends to the application of soil treatments like Aflasafe (currently only available in Nigeria.) Smallholder farmers have limited access to grain drying facilities. Consequently, this exposes maize to higher moisture levels and contribute to an increase in mycotoxin levels. With reduced access to capital and poor storage facilities, other grain pests are more difficult to control

than on larger farms. Another biohazard risk is that smallholder farms have less access to information on the correct use and disposal of pesticides than larger farmers do.

Medium- and large-scale farmers do not exceed 10 percent of the number of farms in any of the studied countries. That said, as a group, they have significantly better access to productive and labor-saving technologies, and have larger farms than smallholder farmers. As a farmer acquires the means to expand her or his farm, labor quickly becomes a constraint. Therefore, the SMS farmer seeks labor-saving technologies to sustain and/or increase productivity. These farmers can effectively reduce the risk of aflatoxin contamination by using mechanical shelling at harvest and by moving shelled and bagged maize to either a maize dryer and/or into a storage facility that promotes air circulation around the bagged maize.

Photo 23 - Poor Storage of Maize



SPS hazard: Increased access to improved storage facilities and better knowledge of pesticide use by larger farmers does not always signify that larger farmers improved practices. In particular, the consultant team found frequent examples of poor grain storage, where farmers placed bags of maize directly on concrete floors, reducing air circulation and increasing moisture in bottom bags.

AGGREGATION

Aggregation of maize is a critical function, except for very large farms that harvest and store a large enough volume of maize to sell directly to large industrial buyers instead of aggregating their harvest. Given the geographical dispersity of small farms with very low yields, there are generally two levels of pre-milling aggregation.

Photo 24 - Small & Medium Farmer with a Tractor in Nigeria



Collectors aggregate from the farm or sometimes from a central village collection point. Generally, a collector will provide maize shelling services at a central location near the farms that surround a village, though this is less common in Burkina Faso. Collectors transport shelled maize to small stores with storage capacity between 30–100 tons. There is regional variation in Nigeria, where farmers in the north tend to pay cash for shelling and other cultivation services, while farmers in the central and southern parts of the country pay for services in-kind with harvested grain. Elsewhere, farmers pay in-kind for shelling services, with one

bag of maize for every 10 bags shelled. Collectors can be independent agents or work on a commission basis for a larger trader.

Traders tend to buy from collectors, though they also buy from and sell to regional maize markets. Traders are the link between village level collectors and larger buyers, including feed mills, breweries, industrial, and semi-industrial processors. They either own their own transporter, or hire the services of one, and are the actor that moves grain across the country and throughout the subregion. Although very few traders test for aflatoxin, the traders who sell to the World Food Programme, breweries, the larger feed mills and industrial food processors are aware of and invest in grain drying and storage on pallets and away from external walls, promoting air circulation that reduces aflatoxin contamination.

Outgrower businesses are a recently emerged actor in the maize aggregation sector. In many communities, one or more farmers manage to acquire more and or larger plots. As soon as this happens, the farmer requires mechanized tilling services because the expanded farm is too large for manual or even oxen cultivation. If the farmer acquires a tractor, it immediately becomes an underemployed resource as soon as the farmer fills his or her fields. As the number of tractors increases, the number of farmer/tractor service providers increases. Many of these farmers begin to offer additional services, including financing their smallholder neighbors' inputs. Payment is often in-kind, so these farmers or outgrower businesses collect grain as payment for services rendered at harvest, which they sell to larger collectors and/or traders.

SPS hazard: The SPS hazard associated occurs during the storage and transport of grain. Grain that is not sufficiently dried can transfer and expand aflatoxin risk, as contaminated grains meet non-contaminated ones. Unfumigated grains allow insect pests to contaminate other bags. A number of projects work with farmers to provide training and education, as do some extension service providers. The Ghana Grains Council (GGC), a private industry association, provides warehouse and grain certification services and conducts extensive education to collectors, traders, and warehouse operators about the proper storage of grain.

PROCESSING

 **Artisanal food processors** are microenterprises engaged in processing domestically consumed food-stuffs, for which maize is a key ingredient. Artisanal food processors sell their products in open-air markets or on roadsides. In countries with vibrant microfinance industries, artisanal food processors are able to access short-term inventory credit. The number and product value of artisanal food processors are growing with increased urbanization, as two-income households reduce the labor available to process household food products.

Photo 25 - Properly Stored Maize in Ghana



category of food processors across the study countries. These companies produce a variety of foodstuffs, similar to those produced by artisanal processors. However, SME food processors target the growing middle-income market and the diaspora African communities in Western Europe and North America. Improved packaging and production practices characterize the products produced by SME processors. As these firms begin to target the export market, their practices come under the scrutiny of global SPS standards. As a result, leading SMS processing companies become advocates for improved national-level SPS controls.

SPS opportunities. SME processors represent a significant opportunity in the maize value chain. A number of them export their products to the ethnic and diaspora market, so they are required to meet international WTO and national SPS requirements. This requirement obligates them to become advocates for improved SPS controls, inspection, and certification capacity in their home countries. The Ghana Standards Authority

Photo 26 - Examples of processed food from SME and Nestlé containing maize from a supermarket in Abuja, Nigeria



SPS hazards are greater with artisanal food processors for several reasons. Most importantly, most artisanal food processors lack access to information on SPS risks and hazards. Faced with liquidity constraints, artisanal food processors are price conscious and more likely to purchase maize before it is sufficiently dried, adding to aflatoxin contamination risk. One risk unique to artisanal food processors is the contamination of food from lead and heavy metals transmitted from locally manufactured aluminum cooking vessels and utensils.

Small- and medium-sized enterprise (SME) food processors are the fastest growing category

actively promotes partnerships with SME food processors to improve standards. Both Ghana and Nigeria have strong food protection agencies that are engaged in ensuring that processed foods are safe from aflatoxins, biological pests, and pesticide and metals residues.

Large-scale industrial processors include industrial breweries, multinational food companies like Nestlé, global supply chain managers like Olam Intl., and large national milling companies like Premium Foods in Ghana and Flour Mills of Nigeria. The reputations of these companies are vulnerable to accusations of violating SPS and food safety laws and guidelines. Most, if not all companies in this category maintain high SPS

Typical single serving size portions of foods cooked in artisanal cooking pots and utensils can greatly exceed daily intake guidelines established by public health authorities for lead, aluminum, and cadmium (Weidenhamer and Kubinski).

standards. The largest of these, like Nestlé, maintain their own testing laboratories. Breweries and Nestlé source maize from milling companies that are able to screen and control for aflatoxin and residue levels.

Photo 27 - Artisanal Maize Processor



SPS opportunities. Large-scale industrial processors create opportunities to upgrade SPS processes. Though they represent a small share of the total maize market, large industrial processors exert pressure on millers to source maize that meets acceptable residue levels. Several of these firms are members of the Ghana Grains Council, an industry association that established a grain warehouse receipting (GWR) program as well as training and inspection services for traders and warehouse operators.

EQUIPMENT

These West African countries, and Africa as a whole, lag behind the rest of the world in agricultural mechanization. The benefits of mechanization include a reduced need for manual labor, timely planting of crops, and improved yields. One indicator of mechanization is tractor usage. Worldwide tractor usage is 200 tractors per square kilometer of land, while in Africa the average is 13, with most of this usage derived from South Africa and the northern countries of Morocco, Algeria, and Tunisia. The most recent available data in Ghana showed a tractor usage rate of 4.5 in 2005, and 6.6 in Nigeria in 2008, with static growth rates or declines in each country. For example, in 2013 Ghana's maize yields were 1.7 metric ton/hectare, with the "achievable yield" being 3.50–7.50 (Ministry of Agriculture, Ghana 2013).

- Three major components that lead to increased mechanization are: 1) a favorable exchange rate as African nations import the majority of these machines; 2) high farm incomes resulting from high commodity prices; and 3) positive financial conditions (e.g., low interest rates and improved access to credit) (BMI Research 2015). Based on these criteria, this implies a weak short and mid-term outcome for increased mechanization, especially in Nigeria where the official exchange rate is deteriorating due to low global oil prices.
- Recent innovative tractor services, such as Hello Tractor, which operates in Nigeria, aim to provide farmers with affordable and increased access to tractor services. According to Jehiel Oliver, CEO of Hello Tractor, 80 percent of the 35 million smallholder farmers in Nigeria (28 million farmers) pay for off-farm labor. There is high demand for farm labor during the high season, and not everyone can pay for that labor (McColl 2015)

Hello Tractor

Jehiel Oliver, CEO of Hello Tractor, started the company in 2014, which has been coined the "Uber for tractor services." The start-up provides tractors fitted with a GPS antenna to alert owners when maintenance is required due to its mileage, and to connect them with nearby farmers in need of services. The company already raised \$3 million in seed money from USAID and other sources, and sold 1,000 tractors to farmers in Nigeria at \$4,000/machine. This cost is low since most entry-level tractors cost \$40,000 and are 55 horsepower, whereas the Hello Tractor is 15. The company wanted to create an affordable tractor for farmers, at a level of horsepower sufficient for the small- to medium-size farms dominating Africa. Farmers can rent a Hello Tractor for \$75/day. This cost is equal to a third of manual cultivation. After deducting operating costs, including loan repayment, a tractor owner stands to make \$25/day as compared to \$5 without it. Furthermore, it allows women to serve as tractor owners and derive another source of significant income (McColl 2015).

Photo 28 - Woman using a smart tractor from the Hello Tractor Company



STORAGE



Storage facilities provide opportunities for producers and traders to store their maize safely and for longer periods, as compared to traditional settings at home with higher risks of contamination. With proper storage, maize producers and traders do not have to sell the maize immediately after harvest, when prices are low. Storage facilities also facilitate access to credit, as banks will offer loans with the stored maize as collateral. Third-party warehouses store this maize and issue receipts to indicate their quantity and grade. The receipts serve as instruments for this collateral. This system is known as a “warehouse receipt system” (WRS) in Anglophone countries and “warrantage” in Francophone countries. Besides access to finance, warehouses also act as service providers equipped with grain cleaners, scales, laboratories, aflatoxin testing kits, etc. Warehouses serve as essential points to detect and prevent the spread of mycotoxins and maize-related diseases. In most of West Africa, the quality of storage facilities and the procedures for storing maize vary. Improper maize storage can lead to contamination and decay, especially the spread of aflatoxin. Warehouses are normally operated privately.

Photo 29 – Maize elevators at Grand Cereals (Nigeria)



- The Ghana Grains Council (GCC) includes 28 warehouses in the northern region of Ghana, and has introduced a WRS that certifies and enforces agreed-upon grain industry standards. Maize producers and traders can bring their stocks to GCC warehouses to obtain this receipt and apply for credit. The Trade Relations Assistance and Quality Enabling Programme (TRAQUE) received 15 million Euros to improve the trade capacity of Ghana through quality assurance and certification systems. TRAQUE will supply and equip 15 selected warehouses with warehousing equipment and testing laboratories (Ekuful 2015).
- “Warrantage” systems are more common in the southern portions of Sahelian countries such as Burkina Faso, due to surplus grain production. Warehouses in the region not only facilitate access to credit, but also improve food security—farmers can ensure that their grain stocks are securely stored, yet located far enough from home to reduce the temptation to sell immediately post-harvest when grains yield lower prices (Sanchez 2015)

Key Takeaways

- Storage facilities can embed SPS services such as laboratory testing and aflatoxin kits.
- Facilities are mostly private.
- Storage facilities provide opportunities for maize farmers and traders to access credit.

MARKET INFORMATION

Information on markets varies depending on the country, as well as ways to access it, and their utility. Information related to quantities of live animals and trade flows is available, but less accessible in regards to the quantities of meat available, their status (fresh, frozen, processed), prices, and market trends. Supermarkets, retailers, hotels, and commercial operators possess some of this information, but it is proprietary. There are

no large data banks with reliable data in ECOWAS nations, and there is no standardized manner to capture data.

Methods of information transmission are increasing, especially with advances in telecommunication technology, such as SMS messaging services. These technologies present clear advantages, but cannot reach large illiterate segments of the population. Given this fact, word-of-mouth is still the most effective and widespread method used to acquire market information.

- Private operators exist, such as the Ghanaian rural information service organization Esoko, which provides information via cellphones. Farm Radio International helps disseminate information via radio broadcasts, which is beneficial for those who are illiterate.
- For a cellphone-based market information system, it is easier to derive benefits for maize than for livestock, because traders do not weigh livestock, which is therefore more difficult to treat as a commodity.
- The West Africa Trade Hub began training national livestock associations in the spring of 2016 on a new MIS platform to give and provide updates on meat and animal feed prices, transport costs, and truck availability. The Trade Hub developed the system in partnership with ImageAd, a Ghana-based IT company (USAID West Africa Trade Hub, April 7, 2016).
- In the past, donors introduced market information systems that tended to fail after financial support dried up. Demand-driven market information services are necessary to ensure sustainability.
- For the cattle value chain, the live markets in each country serve as access points for market information.
- In Côte d'Ivoire and Burkina Faso, livestock traders can access good quality market information through informal networks now linked by cellphone. Burkinabé traders hold back shipments of livestock to Abidjan if they know that prices are not good. They may also reallocate shipments to, say, Bouaké, if prices are higher than in Abidjan. Livestock rearers do not have the same level of market information, nor the same level of flexibility about where and when they sell their stocks.

Key Takeaways

- Market information systems exist in many forms in West Africa, especially with the advance of cellphone technology, but word-of-mouth is still the most widespread.
- Demand-driven market information services are more sustainable.

FINANCE

In West Africa, access to finance for agriculture, and for these specific sectors, is limited. Commercial banks still perceive a high degree of risk associated with agriculture, and if credit is available, lenders generally fund larger, more formal actors. Banks do not often lend to the informal sector because value chain actors have no audited accounts, lenders do not accept animals as collateral, the locations are too remote for agents of financial institutions, and transaction costs are too high. Furthermore, low yields, high-post harvest losses, poor infrastructure, and diseases contribute to the risks associated with lending. However, the advent of new financial services and instruments may gradually improve banks' risk-averse decisions and increase the availability of credit to the sector.

- Projects and microfinance organizations generally help on a small scale. The lack of access to bank loans on a medium scale limit the expansion of fattening or other livestock investments. Banks must be familiarized with livestock-sector risks—in order to quantify and integrate them into normal risk assessments—and to familiarize livestock-sector economic operators with banks so they can draw up a plausible business plan and present it with other needed documentation.
- Ghana, like most countries in the region, relies on external financial support and foreign direct investment as main sources of funding for both the public and private sectors due to its small and underdeveloped capital sector. Limited public sector knowledge and capacity has constrained the use of public-private partnerships to address the gaps in funding large public investment projects (NDPC 2014, p.27).
- Most West African countries have made a gradual commitment to the New Partnership for Africa's Development (NEPAD)'s Comprehensive Africa Agriculture Development Programme (CAADP) to allocate 10 percent of the government's budget to agricultural expenditure (NDPC 2014, p.60). However, actual advancement on this declaration is rather slow.
- According to a West Africa report, interest rates in these four countries, along with Cameroon and Togo, averaged a real interest rate of 11 percent per annum in 2010. Ghana topped the list with 21.3 percent per annum (Carana Corporation 2013).
- Although traders importing ruminants into the coastal countries possess the cash to pay sellers in the Sahelian countries, 80 percent of butchers pay the traders on credit. The interest rates on this credit can sometimes drive the cost of an animal up by 20–25 percent (Kamuanga 2008).
- New financial services and instruments make use of mobile money, e-banking, money transfer services, lease financing, and weather-indexed crop insurance.

Key Takeaways

- The agriculture sector's access to finance in West Africa is very limited and unequal. Access is worse for the informal sector and easier if you are a larger actor.
- Interest rates are in the double-digits and excessive for stakeholders.
- New financial services and instruments are emerging (e.g., mobile money, money transfer services, and rainfall insurance).

ANNEX VI: LIVESTOCK— FUNCTIONS, INSTITUTIONS, AND ACTORS

Please note that the red stars designate the SPS hazard spots along the value chain.

PRODUCTION

★ Regional Trends

- Production throughout West Africa, though very little in tsetse-ridden forest zones; characterized by extensive free-range milk-and-meat production (nomadic and transhumant). Almost all feed comes from the open range, which is plentiful in the second half of the calendar year and scarce at other times, leading to an annual cycle of weight gains and losses.
- Traditional breeds and limited veterinary inputs dominate. Veterinary care is largely traditional, with no solutions to epidemics. Animals are susceptible to transmissible disease when they meet others, often at water points. Small producers make offtake decisions by balancing the benefits of retaining an animal in the household economy with the income resulting from its sale.

Table 13 - Classification of Cattle Producer

Type	Cattle	Sheep/Goat
Small producer	1–100	20–30
Transborder and national pastoralist/ medium producer	100–1,000	50–200
Large producer	Above 1,000	Above 200

- More intensive, sedentary production is growing in importance, often using crosses with exotic breeds, especially in peri-urban Sahelian areas using marketed agricultural byproducts and systematic veterinary care: dairy production or fattening for meat.

- Some government ranches exist to breed improved species and sometimes to develop artificial insemination services.

Three major groups are responsible for cattle production:

Small-scale producers:

- Made up mainly of individuals and low-income earners.
- Small-scale producers often buy one or two cattle that are 2–4 years old and approximately 150–200kg and fatten them for 4–6 months to about 300–350kg.

Transborder and national pastoralists/medium and large-scale producers

- This group consists of nomadic and transhumant pastoralists, who together contribute to the majority of production in these countries. Similar to small-scale producers, pastoralists are mainly present in the northern regions of Ghana, Côte d'Ivoire, Nigeria, and across the border in Sahelian countries.
- They keep and raise their animals extensively, moving from the north during the dry season to the south for water and pasture. During the rainy season, they return north.
- Medium- and large-scale producers include ranches with fenced areas for ruminants to roam and feedlots for fattening.

SPS Hazards: The nomadic Fulani/pastoralists move their animals from one location to the next in search of pasture and water, and mix with other animals that are unfenced and insufficiently vaccinated. This mixing sometimes occurs with other herds at watering points, which leads to the risk of contracting diseases.

- Livestock/animals raised intensively are at risk of contracting disease from new introductions into the herd.
- Extra mixing occurs from:
 - the influx of animals from Sahelian conflict zones
 - constrained grazing in drought years
- Stress from the hot-season and early rainy-season as pasture disappears and animals lose weight
- Lack of individual-animal veterinary care

BACKGROUNDING/FATTENING/FINISHING

 The stage occurs during production and aggregation, and backgrounding more specifically begins after weaning and ends upon placement in a feedlot. Producers and traders provide more forage in combination with grains to increase a calf's weight and build its immunity to diseases before it enters a feedlot. The stage is dependent on geographies and resources available to the producers and trader.

- When rearers sell, fatteners select thin animals for selective feeding over two to three months in a feedlot. They mostly use agricultural byproducts (stalks, shaws, pods, and leaves), hay and fodder crops, with the addition of agroindustrial byproducts and residues (brans, brewing dregs, bagasse, molasses, and cotton-seed cake). Feedlots provide veterinary care.
- Small fatteners with other occupations pursue this occupation once in the year, during the dry season, often using byproducts from their own agriculture. Specialized fatteners with more substantial means can perform up to three cycles annually, but they often depend on buying a high proportion of the feed.
- Most backgrounding/fattening takes place in the Sahelian countries, but coastal-country fatteners select underweight animals delivered to their markets and perform the same job there.
- A kind of fattening-on-the-hoof takes place from January to April when, instead of trucking a herd of cattle to a coastal market, a trader may choose to entrust it to drovers who slowly move it south, taking advantage of the grazing in the coastal-zone countries before trucking it the last few hundred kilometers to market.

AGGREGATION—TRADER

After producers take animals on the hoof to nearby markets and sell to traders.

- Traders aggregate and sell in downstream markets to larger traders or exporters, gradually accumulating truckloads of export-quality animals. Some animals travel on the hoof. These exporters will likely bring their animals to livestock markets that are located near international border posts.
- Traders sell their animals to other traders who buy to fatten, or to butchers who buy to slaughter and then sell to the public.
- In some places, the livestock markets are located close to the abattoir/slaughter house, making it easier for butchers to buy and slaughter without transporting animals long distances. Some cattle fattening also takes place in the cattle market to increase the weight of the animals quickly before they are sold or slaughtered.
- Exporters dispatch trade herds across borders to coastal-country urban markets, mostly by truck, but sometimes by train (Ouagadougou-Abidjan) or on the hoof (in season).
- Livestock cattle markets are widespread in the coastal countries, with more of such markets existing in the Northern regions of these countries.

Processing—Cattle/ SR: slaughter slabs, slaughterhouses, abattoirs, industrial meat processing (sausage makers)



Slaughter slabs

- Slaughtering points made up of built concrete slabs for slaughtering livestock. These slabs are mainly seen in remote rural settlements or villages managed by the local government authority. Few animals are slaughtered and hygienic processes are fair.

Slaughterhouses

- Slaughtering points with concrete slab roofs that can process many animals at a time. Slaughterhouses are predominately located in densely populated urban centers or towns, and state government is the main operator of these facilities. Hygienic processes are better or good.

Public mechanized abattoirs

- Large West African cities have abattoirs, which are generally old and in a poor state of repair (Sanda 2016), (Tjikan 2016).
- Most abattoirs are semi- or fully mechanized and normally run under a public-private partnership (e.g., as seen in Lagos) or solely as a private commercial entity.
- West African abattoirs have mechanized systems designed to follow hazard analysis critical control points and general food hygiene practices, as compared to traditional slaughterhouses. Abattoirs inadequately observe these practices, but the strictly private ones perform better.
- Slaughtering and handling of cattle, even in semi-modern abattoirs, still occurs on floors instead of suspended hooks/tables leading to contamination.
- Lack of water in slaughter facilities.
- The inconsistent supply and high cost of electricity poses a challenge in cold storage rooms.
- Obsolete and/or poorly maintained equipment (e.g., in Kumasi and Accra abattoirs) potentially leads to meat contamination.

SPS hazards: Lack of antemortem inspections and ‘emergency slaughter’ for human consumption of diseased animals at abattoirs.

- Unhygienic abattoir conditions (lack of water and cleanable surfaces), poor hygienic practices (careless cleaning, not washing knives, piercing intestine during dressing), and the lack of an operating cold chain can generate disease.
- Insufficient postmortem inspection (e.g., due to slaughter when vets not present), which is more serious in the rural or remote areas that lack veterinary supervision.
- Carcasses are not systematically stored in chillers, but sent directly to meat shops because people prefer meat fresh, despite unsanitary conditions.
- Evisceration stage found to lead to recontamination of carcasses in some abattoirs, with microorganisms such as salmonella, E. coli, and campylobacteria.
- Lack of biogas plants observed in all slaughter facilities.
- Butchers complained about the lack of compensation if a veterinary meat inspector condemns a carcass during slaughter due to lack of legislation. This creates incentives for veterinary officers not to report diseases for fear of retaliation from butchers.
- Butchers slaughter many animals at the same time, whether diseased or healthy, increasing the likelihood of contamination via infected blood.
- Bovine tuberculosis is an occupational hazard for abattoir workers.

Photo 30 - Abattoir in Kumasi, Ghana



Private and modern integrated abattoirs

- Privately run abattoirs, these facilities may operate as public-private partnerships, or may be strictly private.
- The modern integrated abattoir features mechanization at every phase, with appropriate waste management practices and infrastructure.
- Cattle are not slaughtered on the floor, and carcasses are hung on hooks
- The Halal Abattoir near Abuja, Nigeria is an example of a private, modern abattoir.
- Private veterinary officers usually survey the operations and provide inspection.
- The amount of SPS hazards are minimal compared to the more traditional ones, and the risks for meat contamination and occupational hazard exposure are lower.

PROCESSING OF HIDES/SKINS

- Hides (from cattle) and skins (from small ruminants) are a standard part of the output from abattoirs and slaughter slabs. In the immediate post-colonial era, state-run tanneries in Sahelian countries professionally processed hides and skins, at least to the wet-blue stage. They mostly exported the 'wet-blues.' These state-run entities were not commercially viable and have since collapsed. Some commercial tanneries have replaced them. Ouagadougou has one tannery that produces fully tanned and dyed high-quality leather that it exhibits at European trade fairs. The existence of such tanneries adds value to abattoir products.
- In contrast, in the coastal countries, deficient in animal protein and without a tradition of tanning, butchers cut up slaughtered ruminants with the skin or hide still attached and consumers eat them. Nonetheless, some limited skinning and tanning takes place in these countries.

Photo 31 - Processed Beef Product at Supermarket in Lagos



VILLAGE MARKETS/MARKET MEAT SELLERS/KIOSKS

- These places are all retailing points for livestock products. The village markets/market meat sellers get their meat products from wholesalers/butchers who slaughter from slaughter slabs/slaughter-houses.
- Hygienic practices are not normally strong. Refrigeration of unsold meat products is unlikely, except in urban centers where some butchers' associations buy refrigerators to be used by members at a daily rate.
- Most times, butchers will sell their meat as wholesale or retail in this market.

SPS Hazards:

- The meat products displayed by meat sellers at the village markets are normally not well protected or covered.
- There is high risk of contamination by flies, which can lead to diseases like cholera and typhoid when consumed by humans.
- Hygienic practices are not normally strong. Refrigeration of unsold meat products is unlikely, except in urban centers where some butchers' associations buy refrigerators to be used by members at a daily rate.
- Kiosks typically store unsold meat in their refrigerators, and intermittent loss of power can negatively affect their businesses.

HOTELS AND SUPERMARKETS

- These are the drivers of change in modern slaughtering. High-end hotels/restaurants and supermarkets have food-safety conscious customers. They prefer, and some require, slaughterhouses to employ standard hygienic and safety practices, and will source from semi-mechanized or modern mechanized slaughtering facilities.

TRADE (IMPORTS AND EXPORTS)

- Importers (a.k.a. traders) are usually located in the coastal countries, and venture north into the Sahelian countries to purchase cattle, sheep, and goats. They travel deep into the countries' interiors to obtain the cheapest price at their livestock markets.
- Importers encounter numerous monetary and non-monetary barriers to purchase and transport these animals for sale in the coastal countries.
- Exports of finished animal products to neighboring or international countries are non-existent, but there is growing demand from certain countries (e.g., Gulf States).
- Supermarkets carry imported processed red meat from South Africa, which have premium prices compared to local processed meat.

CRITICAL SERVICES

LABOR

- The wealth of animal capital makes ruminant-raising enterprises inherently capital-intensive. Traditional livestock rearing uses family labor for herding, watering, and milking. In a steady state, household size may limit herd size. Compared to agriculture, there is less seasonality to livestock rearing. The opportunity costs of Sahelian rural labor is about 1,500 FCFA daily.
- Purchased inputs and the absence of grazing make fattening more capital-intensive per animal and less labor-intensive than traditional livestock rearing. However, the labor intensity rises if the fattener himself cultivates fodder crops for fattening, with the exception of irrigated crops.
- Alongside livestock farmers and herders, traditional marketing channels dealing in animal products generate thousands of secondary jobs. In Burkina Faso, these channels generate an estimated 60,000 full-time jobs (USAID/Abt 2014).
- In Ghana, agriculture employs 45 percent of the labor force, followed by services (40.9 percent) and industry (14.4 percent) (NDPC 2014), meaning it has regained the primary position as the largest employer after being second in 2010 to services.
- Many youth, especially boys, work at the livestock markets and slaughterhouses to help rear, filet, and dress the animals. The slaughterhouses compensate youth with portions of meat. They either keep

Photo 32 - Workers fileting and dressing slaughtered animals in an Abuja slaughterhouse



this portion for personal consumption or sell it to small traders in the nearby markets. Workers at traditional slaughterhouses will not support and work in modern abattoirs if it displaces their current jobs.

- The cattle value chain contributes 10–25 percent of gross domestic product (GDP) in the Sahelian countries. By including the value of the labor force and animal manure produced by the cattle value chain, its contribution would reach 25–30 percent for GDP and 50 percent for agricultural GDP (USAID/Abt, 2014, p.16).

Key Takeaways

- Livestock rearing is labor- and capital-intensive, especially if the rearer cultivates his/her own fodder for fattening.
- Livestock sector generates thousands of secondary jobs in West Africa.
- The livestock value chain provides employment for many youth, especially at livestock markets and slaughterhouses. They will not be supportive of modern abattoirs if they displace their current jobs.

INPUTS

FEED

- Traditional rearing requires little extra feed. When little pasture is available, animals lose weight. Rearers usually provide salt licks and/or nutritional blocks for minerals and nutrients. During the hot season when livestock lose weight, rearers may offer cotton-seed cake or other high-protein supplements.
- Fatteners use agroindustrial and agricultural byproducts, fodder crops, and gathered vegetative biomass. They also provide salt licks and/or nutritional blocks.

FORAGE

- Traditional livestock rearing offers almost no other feed source except the forage that animals graze. On the edge of the Sahara Desert, rainy-season pasture may be of high protein content and may provide a very rich animal diet, particularly if it grows on salty soil that provides minerals in the diet. Other forage includes a multitude of annual and perennial grasses and, sometimes, leaves (though cattle and sheep are principally

Photo 33 - Trader providing vegetative biomass as fattener



Key Takeaways

- Traditional rearing requires little extra feed, while fatteners use agroindustrial agricultural byproducts.
- In traditional livestock rearing, animals forage for food by grazing.

grazers, not browsers). After the harvest, transhumant animals may graze on crop stubble and residues, though farmers increasingly harvest this to feed to their own more sedentary livestock during the hot season.

VETERINARY SUPPLIES/SERVICES

- Traditionally raised ruminants receive traditional treatments for disease and parasites, and a few modern veterinary medicines. However, traditional herders recognize the value of inoculation against epidemic diseases and bring their animals to government-run vaccination campaigns. These campaigns reach only a fraction of the targets they set for a variety of reasons, including limited domestic vaccine production. Low production levels stem from factors such as meager public funding, poor maintenance of vaccine machinery, and unreliable and costly resources (e.g., electricity and water) needed for vaccine manufacture.
- Low-cost veterinary medicines available in local markets—often imported illegally and of dubious efficacy—may tempt traditional herders. Governments approve relatively few options for veterinary medicines, which are often expensive. Approval of more such drugs would limit the extent to which herders try the spurious and sometimes harmful drugs they find in the marketplace.
- Fatteners administer veterinary inoculations and other treatment to their animals.
- Most vaccines and biologicals come from the United States, Europe, and Asia. As the foreign exchange decreases in these countries, these products become more expensive for producers limiting their usage.
- In Nigeria, the National Veterinary Research Institute (NVRI) is responsible for diagnosis of animal diseases and production of indigenous animal vaccines. However, the number of vaccines produced for cattle, sheep, and goat do not meet demand. This shortage is due to a host of factors including lack of funding, inadequate cold chain facilities, and management.

Key Takeaways

- Traditional rearing still relies on traditional cures, and government vaccination campaigns only reach a fraction of their target numbers.
- Approval of more drugs by the government could mitigate the use of harmful and fraudulent drugs.
- Although countries produce some of their own, most vaccines and biologicals come from the United States, Europe, and Asia; they are becoming more expensive due to the limited foreign exchange.

MARKET INFRASTRUCTURE

- In West Africa, rail fences now normally enclose major markets to contain the livestock, control animal flows through the market, and ensure the collection of market taxes at well-defined entrances. The markets also feature a water source, holding pens, and truck-loading ramps with lighting (for loading in the evening). Maintenance is often poor, sometimes because market-management committees are corrupt. There is no defined quarantine pen.
- Some markets have animal scales in hopes that some influential buyer will want to buy animals by weight, though this scarcely ever happens. Traders, sales brokers, and butchers distrust and dislike scales because they represent a threat to their advantage of being able to eyeball an animal's value. If the market were to migrate to sales by weight, anyone could do it. These market professionals always deny responsibility when newly installed scales are vandalized.
- In Ghana, the government controls all the livestock markets through district and municipal assemblies.

Photo 34 - Cold chain facilities at NVRI



Photo 35 – Traders unloading cattle at a live cattle market near Abuja



Key Takeaways

- Market infrastructures in these four countries provide basic quarters for the animals, but maintenance is often poor and management committees are corrupt.
- Traders, sales brokers, and butchers distrust and dislike scales.

Inspection

- Inspections of live animals and meat generally occur at two stages: at international borders and within national borders. Within national borders, the interstate and intra-state posts, the live animal markets, and slaughterhouses conduct inspections to varying degrees.
- Inspection at each border generally requires, but is not limited to, the following documents: 1) certificate of origin, 2) import/export permit (a.k.a., “movement permit”), 3) international health certificate. Besides these documents, a government official from the veterinary or quarantine services will conduct an antemortem inspection. If the animal is healthy, the authority will let the trader pass. If not, the animal may be tested, quarantined, and then treated before the shipment can continue moving.
- Another round of inspection occurs when the animal is brought to the live animal market and then before slaughter. An antemortem inspection occurs prior to slaughter and a postmortem inspection immediately afterwards.
- Members of ECOWAS and the UEMOA are supposed to follow the inspection procedures and standards for food safety codified in the Codex Alimentarius. The judgements passed onto edible meat products should take into account information from the following source: information from primary production; observations made of animals at the lairage; antemortem inspection; and post-mortem inspection, including diagnostic tests where required (United Nations Food and Agriculture Organization and World Health Organization 2005).
- Despite these procedures and standards, the majority of traditional slaughterhouses and industrial abattoirs in the four countries had deficiencies in attaining these levels. The private abattoirs were more successful, given their access to financial and human resources, as well as more demanding buyers.
- Constraints to proper antemortem and postmortem inspection: number of available veterinary staff, adequate equipment and facilities, design of abattoir and border posts, etc.

Photo 36 - Meat parts separated during postmortem inspection



Key Takeaways

- Inspection occurs at international and national borders, live animal markets, and slaughterhouses.
- Border inspections require several documents that can serve as non-tariff barriers despite their purpose to monitor and control animal health.
- ECOWAS/UEMOA nations follow food safety standards and procedures in the Codex Alimentarius, yet only partially achieve these standards.
- Private modern abattoirs adhere more strictly to these food safety standards and procedures.

ANNEX VII: POULTRY— FUNCTIONS, INSTITUTIONS, AND ACTORS

Please note that the red stars designate the SPS hazard spots along the value chain.

PRODUCTION—HATCHERIES (SMALL- AND MEDIUM- AND LARGE-SCALE HATCHERIES)

- Hatcheries are the primary production centers for day-old chicks, and vital to the survival of the industry. The quality of chicks produced by hatcheries determine the success of the birds' life cycle (both layers and broilers).
- Major hatcheries in the focus countries vertically integrate production from day-old chicks to the sale of broiler and eggs. These hatcheries include Obasanjo Farms, Amo-byng, Zarteck, and Chi Limited in Nigeria and Akate Farms in Ghana. They all have breeding stocks that produce hatching eggs for day-old chicks.
- Some of the large-scale hatcheries also run their own poultry farms. The hatcheries are high earners and are capitalized.
- The available hatcheries are not able to meet demand for day-old chicks.
- Hatchery diseases like Marek's, salmonellosis, and lymphoid leucosis have been sources of early poultry losses, but these have reduced in recent times.
- Aflatoxin in feed has also led to severe losses of poultry chicks.

Photo 37 - Day-old chicks at animal care in Nigeria



SPS hazards:

- The hatcheries are sources of disease transmission to day-old chicks. The parent stock normally pass these diseases to the day-old chicks, leading to early mortality. They include salmonellosis, Marek's disease, and lymphoid leucosis aspergillosis/mycotoxicosis.
- Mycotoxicosis from poultry feed is also a source of problems in poultry production, even at the level of day-old chicks.



Day Old Chicks Suppliers

- Suppliers serve as intermediaries between the hatcheries and the end users/poultry farmers.

- They make their living and profits from the difference in price of purchase to the price they sell to end users or poultry farmers.
- Transportation of day-old chicks by road is very risky and costly. Many suppliers lose enormous numbers of day-old chicks because of stress or accidents.
- In Ghana, the poultry sector imports the majority of day-old chicks from abroad, especially Belgium and Holland. Day-old chicks are classified as layers, broilers, or cockerels.



Producers (backyard, low-, medium-, and large-scale)

Traditional production, characterized as backyard, low, and medium-scale producers, are the main source of production throughout West Africa, although less so at lower latitudes. For example, of the 180 million birds in Nigeria, 120 million are the yield of backyard producers, 50 million come from commercial operations, and 10 million from illegal imports (Karombo 2015). Large commercial farms characterize modern production.

- Free-range egg-and-meat production with traditional varieties and limited veterinary inputs (dominates)
- Intensive, often peri-urban production growing in importance
- Exotic breeds, maize-based poultry feed and systematic veterinary care
- Either eggs (with old hens sold for meat) or meat
- Sometimes using outgrowers

a) Backyard producers

- Backyard producers are poultry farmers who keep birds around their homes, and can keep between 50–500 birds. Some can keep up to 1,000 birds, depending on the space around their houses.
- These indigenous chicken breeds live an untended, semi-feral existence around houses for much of the day, but return to the house or coop during inclement weather and at night for protection against predators.
- Backyard poultry farming serves as a supplementary source of income for these producers, who have other primary livelihoods.
- Most receive little or no veterinary medicine, so morbidity and mortality from disease, particularly Newcastle disease, are high.
- Throughout the region, women and children tend to poultry production, but men are more associated at the marketing stage.

SPS hazards:

- Most receive little or no veterinary medicine, so morbidity and mortality from disease, particularly Newcastle disease, are high.
- At an early age (first three weeks), the birds are more likely to contract diseases such as Newcastle and Gumboro disease, especially without veterinary care and inoculations. Broilers attain live bird weight for sale at 6–9 weeks of age, but are also very weak during this growth phase and easily die from stress and heat. These two diseases are a source of mortality in poultry production. More recently, avian influenza (AI) joined the list.

- Mixing of free-range birds: backyard poultry producers with poor sanitary measures face a higher risk for disease. Local birds often come in close proximity to their poultry, sometimes entering their poultry pens. The free-flocking local birds harbor many disease agents.

b) Low- and medium-scale producers

- Poultry farmers who keep and raise poultry birds in by the thousand (3,000–10,000) as their main source of livelihood (income).

SPS hazards:

- Small- and medium-scale producers practice minimal biosecurity, sometimes permitting free-range and wild birds to gain access to their poultry houses, making them susceptible to outbreaks such as avian influenza (Ashitey 2013).
- Their hazards are similar to backyard producers.

c) Large Commercial producers

Photo 38 - Dormaa Ahenko Atta-Adu Farm of 35,000 Layers in Ghana



- Producers who are involved in hatchery, feed milling, and production activities. The capacity of some of these farms can be up to 300,000 birds.
- Due to the size/capacity of their business, it is cheaper for large commercial producers to vertically integrate, hatching and rearing chicks, and producing their feed.
- They sell equally to others through distributors all over the country. Though there are few who are not involved in hatchery production, they still engage in feed milling and production. Those involved in the hatchery business control the availability of day-old chicks.
- Using exotic high-performance breeds, modern poultry production usually takes place in capital-intensive farms on the outskirts of cities. Chickens live in purpose-built sheds that protect them from rain, from predators, and from traditional poultry and other birds that might carry disease.
- The birds receive precise feed rations based on maize and soya, according to their age and purpose (eggs or meat) and good veterinary treatment. The meat is more tender but blander than the meat from traditional chickens.
- The biggest farmers will vertically integrate cultivation of maize and soya, breeder farms and hatcheries, meat and/or egg production (including veterinary care), slaughter of the chickens at the appropriate age, and marketing and sales. However, in parallel, many smaller operations buy in their day-old chicks, their feed, and their veterinary treatment, focusing on the production itself and possibly the marketing and sales.
- They include Amo-Byng and Animal Care Farm in Nigeria.

- In Ghana, there are currently less than 20 large-scale commercial poultry operators, producing mainly eggs with limited production of broiler (meat) (Ashitey 2013, p. 3). The major large commercial producers in Kumasi and Accra are Akate Farms, Kwabena Darko Farms, Asamoah-Yamoah Farms, and Jifanko Meat.
- In Côte d'Ivoire, Foani and Nexteckci are big poultry companies operating in the region around Agnibilékro, near the border with Ghana.

Case Study:

Foani is a modern poultry firm based in Agnibilékro, near the Ghana border, the second biggest chicken-production zone in Côte d'Ivoire (after the Abidjan peri-urban zone) and the largest egg-producing zone. Foani has a vertically integrated business organized around rearing broilers and layers. The company produces its own certified day-old chicks, some of which it distributes to outgrowers both within Côte d'Ivoire and in the nearby part of Ghana. Its day-old chick facility has 40,000 layers producing 900,000 chicks annually. It feeds its chickens with feed produced in its own factory. The feed is based on maize, about 10 percent of which comes from its own farms, with additional quantities from outgrowers. Foani buys the rest of the feed from other parts of Côte d'Ivoire, with a preference for the maize from the north (which, given the limited traceability of the maize chain, may include maize from Burkina Faso). It occasionally imports maize, including from Brazil. The company has a maize-storage capacity of 12,000 tons. Foani sends some of this maize supply across the border with the chicks from Côte d'Ivoire to its outgrowers in Ghana, along with veterinary inputs. The outgrowers send back broilers that have reached the age for slaughter, which, along with broilers from Foani's own farms and Ivorian outgrowers, feed into its abattoir and processing plant that slaughters 300,000 birds annually. The company markets its chilled chicken carcasses in supermarkets in Abidjan and elsewhere in Côte d'Ivoire, but does not export them to Ghana because its carcasses are not frozen and because they are not competitive with Ghana's own production. However, Foani exports much of its egg production to Ghana in trays it manufactures. Foani is not involved in imports from Ghana of old layers to meet holiday demand or with dry-season imports from Ghana of chicken droppings and litter to meet the needs of cocoa farmers.

SPS hazards:

- After the recent outbreaks of AI, medium- and large-scale commercial poultry farms show evidence of improved biosecurity measures. The epidemic ravaged various countries in the region over the past 10 years.
- Despite improved biosecurity measures, modern farms face the risk of larger numbers of poultry in close proximity.

AGGREGATION—TRADER OR AGGREGATOR



Traders/Live Bird Markets

- Backyard, low-, and medium-scale producers take birds to local live bird markets and sell them to traders (or traders buy at the farm gate). They are normally present in both urban and rural areas.
- Traders sell various categories of bird at live bird markets, including spent layers, broilers, pigeons, ducks, local birds, and wild birds. Eggs are also aggregated and sold at live bird markets.
- Traders aggregate and sell in downstream markets to larger traders or exporters, gradually accumulating.

- Traders transport birds in truckloads of stacked cages (when upstream, they are more likely a part of mixed cargo).

SPS hazards:

- Irregular watering and feeding at markets.
- Stressful caging for road transport between markets, including delays at borders, often without feed or water for 24–36 hours.
- Human consumption of birds that died in transit.
- The live bird market is high disease risk spot due to the volume of birds present. Local, wild, and domesticated birds are available in the market.
- The arbitrary use of poultry drugs on sick birds, which are sold at the market with drug residues that can contribute to disease resistance in humans.



Poultry trader (middle in red shirt) at live bird market in Lagos—Beaconness C.O. Adedo

- Beaconness is married with a husband, who is a retired civil servant. She has eight children.
- She started selling poultry in the market 40 years ago, and has been coming every day since. She arrives at 7:30 a.m. each day and departs at 5:00 p.m. She sells about three to four birds per day during non-festival season and 20 birds per day during festival season. She sells 10 crates of 30 eggs per day, with each crate costing 700–900₦.
- She received a loan from her family to start her business.
- She uses profits from her business to pay for her children’s school fees and food for the household.
- SPS measures: she purchases disinfectants and vitamins from the veterinary drug store. She gives vitamins to the birds to relieve stress and sweeps daily.
- Challenges: it is difficult to obtain loans to purchase more stock. She has 50 birds currently, but would like a loan to keep 1,000 birds.

Photo 39 - Poultry trader, Beaconness, at live bird market in Lagos



PROCESSING

- Slaughtering/processing of broilers or spent hens takes place at or near the point of consumption, this could be at the home, maquis (open-air restaurants), or at the live bird market. Poultry is then dressed.
- Conditions where birds are slaughtered and dressed in these markets exhibit minimal biosecurity measures: lack of potable water, blood and feathers strewn across the floor, uneven use of soap/disinfectants, etc.

SPS Hazards:

- Conditions where birds are slaughtered and dressed in these markets exhibit minimal biosecurity measures: lack of potable water, blood and feathers strewn across the floor, uneven use of soap/disinfectants, etc.

Butcher in Poultry Market—Aliyu Abdulaziz

- Aliyu is 37 years old and from Kano State. He has a diploma in urban planning. He has a wife and two children.
- Aliyu has been a butcher for 14 years. Although his father was not a butcher, it was his childhood goal. He comes to work every day from 7:30 a.m. to 6:30 p.m.
- He purchases and sells 20 to 30 dressed chickens per day. He buys a broiler at 800 ₦, and sells it for 1,000 ₦. He buys spent layers at 1,050 ₦ and sells them for 1,200 ₦.
- Challenges: Occasionally three to four birds get sick per day, but they try to sell the birds before they become ill by reducing the price. There is a lack of affordable and potable water. Aliyu pays for 15 drums (150 ₦/drum) a day during busy days, and eight to nine drums when he is less busy.
- He has not tried to grow his business because interest rates are too high.
- SPS measures: Aliyu hires someone to clean and pile the discarded feathers. Before the slaughter, he and his associates wash their hands and wear slippers in the slaughter area.
- His profits allow him to get by with his family, but he would like to purchase a home.
- If he can obtain a loan with low interest rates, he would like to grow his business to 200–250 birds/day

Photo 40 - Butcher, Aliyu, in poultry market in Nigeria



Processing at large-scale farms

- Farmers cull birds for sale at 2.0–2.5 kg.
- Birds are already aggregated, with the possible exception of those raised by outgrowers.
- Slaughter takes place within the farm or nearby.
- A cold chain takes the chicken carcasses to retail outlets and supermarkets.

Village markets/food stalls/eateries

- These retail points are more likely to get their poultry products from backyard farmers and low- to medium-scale farmers.

Hotels/supermarkets

- These retail points and end users primarily get their poultry products from large commercial farmers, who process and package the products. Both the poultry meat and eggs are packaged and branded for sale at supermarkets.

TRADE (IMPORTS AND EXPORTS)

- Export of traditional chickens have officially stopped due to imports bans, but in fact continue via informal routes. Imports of frozen broilers from outside West Africa are more significant than trade of live birds across borders.
- Imports only occur in Ghana to keep up with consumer demand. In 2015, the country imported 435,509 eggs (Karombo 2015).
- If imports take place into countries with imposed bans, officials generally extract bribes. There is some illegal cross-border trade.

AVIAN INFLUENZA (AI)

Of the major diseases afflicting poultry in West Africa, avian influenza (AI) caused the most acute damage given its zoonotic nature. The AI subtype of H5N1 is a highly pathogenic virus. H5N1 initially occurred in West Africa in 2006, but was eliminated by 2008. AI reappeared in Nigeria in late 2014, spreading to many parts of the country within three months and causing 1.6 million avian deaths. By July 2016, Nigeria had been the most affected country, with outbreaks exceeding 750 and nearly 3.5 million birds dead or culled (Outbreak News Today 2016) The pathogen spread to all four countries analyzed in this study, along with Niger and Cameroon

(United Nations Food and Agriculture Organization 2015). The virus spreads to other birds through saliva, nasal secretions, and feces, and to humans via direct contact with infected birds. A vaccine does exist, but its effectiveness is questionable. The epidemic has generated vast direct and indirect costs in the sector and region, including the destruction of millions of birds, public funds diverted to eradication of the disease and compensation of producers, and the wiping out of livelihoods of actors along the value-chain.

- In Ghana, farmers culled about 100,000 birds, and 35,000 died naturally from the disease.
- The Ghanaian government released GHC 11 million to control this outbreak, which proved insufficient. The government only provided compensation for culled birds, not ones that have already died. As a result, a majority of producers received negligible amounts of compensation relative to sale price, and tried to sell sick birds instead of disposing of them.
- In Nigeria, AI afflicted 26 out of 37 states and 121 out of 747 local municipalities. Government has paid compensation to 275 farms/farmers and one zoological garden for just over one million birds out of nearly 3.5 million birds in total. Producers complained that the government's compensation payment rate

Photo 41 - Disposal of birds afflicted with avian influenza in Nigeria



Key Takeaways

- Avian influenza is highly pathogenic and has wreaked havoc on the poultry sector in the region, adversely affected the livelihoods of all the value chain actors.
- Compensation to producers has been starkly insignificant.

is too low (between 100–750~~₦~~ depending on the age / production stage of birds) as compared to market price. Compensation payments are slow due to dwindling oil revenues, and most producers have been paid with financial support and donations derived from international organizations.

CRITICAL SERVICES

LABOR

The poultry sector in West Africa generates large numbers of primary and secondary jobs. While traditional systems are still, and will remain, deeply entrenched, greater quantity and diversification of jobs should develop as the sector continues to develop modern production practices to appease consumer demand.

In both traditional and modern systems, the cost and availability of labor heavily influences production. For modern systems, well-qualified labor is more significant, especially to ensure effective operation of the enterprise. However, if a household's size is large enough, family members can meet labor requirements (Heise 2015).

Traditional production

- An attractive aspect of traditional chicken rearing is that it requires little capital (for the birds or inputs) and little labor, though productivity is low and losses are high.
- Women and youth generally play a more active role in traditional systems, tending and feeding the chickens. Men are also involved, but are more engaged in marketing.

Modern production

- Investment in chicks, chicken sheds, and veterinary and feed inputs make modern chicken rearing more capital-intensive. For large industrial producers, operations are more labor-intensive.
- A large integrated producer such as Akate Farms employs over 480 people, with 70 engaged as casual workers and another 1,000 earning their living as outgrowers on maize farms to supply the feed mills. Staff enjoy benefits, such as assistance to acquire land and accommodation for their families, along with other fringe benefits (Dapatem 2016).
- In Ghana, the cost of labor for commercial poultry farmers is so high that they are unable to meet their obligations for payment of wages and salaries. The implementation of a single salary structure granting minimum wage levels to all workers compounds this issue.

INPUTS—FEED

In the poultry sector, feed is responsible for 60–70 percent of production costs in these countries. The cost of feed fluctuates with the cost of raw materials, especially maize, and soya cake. The coastal countries produce significant amounts of feed, but have been required to import from maize-surplus countries such as the

Photo 42 - Poultry worker in Nigeria



Key Takeaways

- The poultry sector generates large numbers of primary and secondary jobs.
- Traditional production is less labor-intensive than modern systems.
- Diversification of jobs will increase as modern farms emerge; these jobs could attract youth.

United States, who produce it more cheaply. Poor productivity and the presence of aflatoxin in maize, as identified in the earlier section, pose serious issues for the poultry sector and for animal and human health.

Traditional system

Traditional chickens receive little feed that they do not find themselves. They may benefit from scraps of food from the kitchen or small quantities of residual grain from farmyard operations.

Modern system

Chickens receive tailored feed according to their age and whether they are broilers or layers. All poultry feed is based on maize, with soya as an important second ingredient. Other ingredients are cotton-seed cake, fish meal, and micronutrients, minerals, and vitamins. Some chicken producers grow their own maize and soya, while some manufacture their own blended feed. Farmers prefer low-humidity maize because it is less likely to go moldy and, in particular, become susceptible to aflatoxins.

Photo 43 - Bags of maize feed at Akate Farms in Ghana



- In Ghana, poultry consumed approximately 400,000 MT of maize in 2016 (approximately 40 percent of the maize marketed). The volume of high-quality yellow maize going into commercial poultry feed is about 200,000 MT. Roughly 150,000 MT of this is produced in Ghana, imports represent approximately 50,000 MT, and locally produced white maize makes up the remaining 175,000–200,000 MT.
- The poultry industry prefers yellow maize, since it contributes to a more pronounced yolk color for layers. Commercial poultry feed producers and large integrated poultry companies use an additive in feed produced with white maize to compensate for the yolk color impact. Small-scale poultry producers do not, and the eggs they produce are significantly paler.
- In Nigeria in 2016, due to the scarcity of maize in the country, some food processing companies and animal feed mills are required to import. However, the foreign exchange scarcity is affecting the process. The price of maize has risen to about 110,000 ₦/ton

Key Takeaways

- Feed is 60–70 percent of production costs.
- Poor maize productivity and aflatoxin are serious issues for the poultry sector.

VETERINARY SUPPLIES/SERVICES

- The majority of vaccines and biologicals come from the U.S., Europe, and Asia. Due to limited foreign exchange and currency depreciation, especially in Nigeria, these items are becoming more expensive. This disincentivizes their use, or increases the purchasing price of livestock.
- Imported vaccines are less effective than local vaccines due to local strains of diseases.
- Efficacy of domestic and imported vaccines may be poor due to the lack of cold chain facilities, reliable electricity, or from improper application.
- Private laboratories provide affordable veterinary services that the public sector struggles to offer, due to a lack of resources or accessibility. These services include disease and feed testing, technical assistance, and medicine/biosecurity products.

Photo 44 - Poultry vaccines at NVRI



Traditional system

- Traditional chickens may receive inoculation against common and serious diseases such as Newcastle, but not systematically. They are unlikely to receive any other modern veterinary medicine.

Modern system

- Day-old chicks may already be vaccinated, and chicken farmers systematically inoculate their birds against widespread diseases, such as Newcastle. Prevention of disease is important to them because the high density of birds in poultry sheds could lead to rapid spread of disease and high mortality.
- In West Africa, public laboratories such as the National Veterinary Research Institute (NVRI) in Nigeria are responsible for diagnosis of animal diseases and production of indigenous animal vaccines. The institute has been operating below capacity in vaccine production due to inadequate funding, ineffective management, and broken equipment.
- Private labs such as Animal Care in Nigeria offer comprehensive services such as disease and feed diagnoses.

Key Takeaways

- Public veterinary services are inadequate and insufficient due to lack of resources. The private sector fills the gap.
- Vaccines and biologicals are mostly imported, but less effective than local vaccines.
- Unlike traditional chickens, modern chickens are systematically inoculated.

MARKET INFRASTRUCTURE

The traditional market infrastructure for chickens in these four countries is rudimentary, poorly maintained, crowded, and dilapidated. There is generally an area for the sale of live birds and one for slaughter. Similar to cattle markets and butcher areas, financial resources are limited, and access to water, electricity, and cold-chain facilities are available, but limited. As a result, markets are sanitary hazard spots for poultry and facilitate the transmission of animal disease and zoonoses.

Traditional chickens

- Chicken markets have sheds for tens or hundreds of chickens, organized by cages of different sizes and shapes for 40–80 chickens. Water and feed are available. There is no additional infrastructure.

Modern chickens

- Modern birds are available in supermarkets, hotels, restaurants, and eateries. These facilities are better equipped and have better SPS standards.

INSPECTION

Both inspection protocol and standards in these countries should follow the OIE and Codex Alimentarius policies, but uneven gaps exist in their implementation.

Traditional chickens

Poultry should undergo antemortem and post-mortem inspection by veterinary public health officials in these countries.

While veterinary officers work at major live bird markets, they are less prevalent in more remote areas or to provide immediate inspection for birds slaughtered in backyards.

Modern chickens

Modern chickens receive antemortem and postmortem inspections from private veterinary services paid for by large poultry farms. This ensures better, consistent, and more reliable communication to limit the risk of diseases and residues. See Annex VIII: List of Persons Interviewed.

Photo 45 - Poultry market in Abuja



Key Takeaways

- Traditional market infrastructure is poor and dilapidated, with high sanitary risks.
- Inspection is limited and perceived as a barrier to sale for traders of traditional chicken. Private veterinary officers typically inspect modern chickens using more stringent inspection policies.

ANNEX VIII: TRACEABILITY

Streamlining the red-meat value-chain to provide hygienic meat

The value chain for cattle and sheep does not allow traceability so that, for instance, the Ivoirian livestock service can contact their Burkinabé counterparts with specific information about disease detected in postmortem inspections at the abattoir at Port Bouet, Abidjan. There are several reasons for this:

1. The value chain is too long to transmit information between the herder and the consumer.
2. After reaching their destination, the animals are not identifiable (either individually or by traded consignment).
 - a. The economic operators have no interest in retaining information, particularly at the level of the individual animal.
 - b. These operators may be marginally literate, which would limit their ability to record information, even if they wanted to.
3. The livestock service certifies health at the herd level but does not record or analyze the data collected.
4. Health inspections are cursory, with a small chance of detecting a biosecurity risk.

Yet everyone agrees that the animals traded can harbor disease. Although trucked animals may not seriously compromise the health of other animals grazing in the territory where their trucks pass, this is much less true for the minority of cattle that trek on the hoof through northern Côte d'Ivoire from January to April. By extension, cross-border transhumant herds surely spread disease as they oscillate back and forth across the border between Sahelian and coastal countries every year. Some might argue that until the transhumant transmission problem is solved, reducing the disease carried by trade livestock is a secondary problem.

However, there are two strands of rebuttal to this argument. First, independent of the argument's objective truth, consumers in coastal countries are becoming wealthier, more selective, and more numerous. They care about the quality of their food, particularly the meat that they eat. Any suggestion that their meat might be diseased is a problem, because they can turn to poultry, fish, or imported red meat. If this happens, the price of West African red meat will fall and, given the relatively efficient ruminant-marketing system, the welfare of the poor herder at the top of the value-chain will drop. Therefore, the sector needs to build a sense of accountability through a traceable value chain that reassures the coastal middle-class consumer that his or her red meat comes from an identifiable, disease-free source. There is a need to build trust, if not a brand—or a series of brands—that a subgroup of economic operators will defend.

Secondly, though we may accept the argument that the primary problem is the economic damage done by the spread of disease due to poorly vaccinated transhumant herds and inadequate veterinary treatment for individual transhumant animals within these herds, it is an enormous problem to solve. The fundamental constraint is livestock mobility, which existed in developed countries until the nineteenth century, when animal health was a similarly grave problem. Livestock mobility meshes with issues of land ownership, on the one hand, and personal freedom and the identity of pastoral peoples, on the other. Sedentarization is underway in Sahelian countries but it is a slow process, particularly at 'pure pastoral' higher latitudes.

While livestock mobility continues to pose intractable difficulties, it is within our power to attack the secondary problem of traceability and consumer satisfaction with West African meat, while simultaneously making

constrained herding with healthy animals more profitable. The solution is to shorten the value chain, connecting herders of high-quality livestock to supermarkets that will pay a premium for quality. A shorter value chain divides the considerable consumer surplus that middle-class consumers are prepared to pay among a smaller number of economic actors. Specifically, rearers of healthy ruminants can sell to a company—the supermarket, a partner in a joint venture with the supermarket, or an independent trading company. This arrangement would bypass collectors, traders, exporters, and butchers, as well as the sales brokers at each stage. This list groups together the more traditional and least literate of the economic operators. These actors could continue doing business, but would be excluded from this high-value strand of the chain unless they changed their methods.

Photo 46 - Bobo-Dioulasso Abattoir Truck



The obvious concentrated source of healthy animals would be peri-urban fatteners in Sahelian countries. These relatively well-off producers invest in crossbreeds for greater productivity and protect their investments by not skimping on veterinary treatment. Peri-urban fatteners cluster around cities, lowering the costs of assembling trade herds. The number of animals involved, at least initially, would be manageably small. Producers would tag each animal for identification. The resulting traceability would incentivize all value chain actors to ensure quality, which patently does not exist in the current mass

market for ruminants and red meat. The supermarket would be able to communicate consumer dissatisfaction directly to the trading company, and the company could provide feedback to the rearer, perhaps with a warning or with an offer to send a veterinarian to check the other animals in the herd: carrots and sticks.

Profitability would encourage peri-urban fatteners to increase their participation. In addition, a key component would be publicity to communicate the method and profitability of the system to other peri-urban fatteners and potential outside investors. The publicity could contribute to a potential increase in supply as the coastal market expands. Publicity would also target banks to communicate the risks and benefits involved, so these institutions could reappraise their timid approach to financing the livestock sector.

Initially, the high value chain would have to work within existing structural constraints, notably crude livestock trucking and low-quality municipal abattoirs in coastal countries. The West African Trade and Investment Hub proposes to experiment with livestock-specific compartmentalized trucks in order to limit the stress and physical damage to animals during the truck trip to the coast. However, there are doubts about how suitable such a truck would be for carrying non-livestock cargoes in the other direction. In substandard abattoirs, it would be important to work with butchers who are prepared to make extra efforts to avoid contamination of the carcass and to expedite its transfer into a cold chain. However, two changes could limit the importance of these constraints. First, hygienic, privately managed abattoirs are being proposed in Anyama (28km from Abidjan), Madina (an Accra suburb), and probably elsewhere, which would alleviate the problems of meat contamination in the abattoir (Ministère des Ressources Animales et Halieutiques 2014). Secondly, privately managed abattoirs are under consideration in Sahelian cities, which would make it possible to

fly meat directly from the Sahel to West African coastal capitals. Further, combined with traceability to the farm, hygienic Sahelian abattoirs would open up a range of other destinations for quality red meat, including North Africa, Central Africa, and the Middle East. Various certifications and additional inspections would be necessary, but the participants should welcome the opportunity to extend the demand for high-quality Sahelian livestock. At the same time, this quality-driven approach would benefit the middle class in Sahelian countries too. Furthermore, less affluent meat consumers would be sensitized to quality, and at least some of the improvements in hygiene would spill over into the mass market.

The slaughter of a significant number of ruminants in Sahelian countries would increase the number of hides and skins available for tanning and other value-added products. It would also increase the quantity of offal and other non-red meats available on the Sahelian market. At the same time, as Sahelian markets for red meat would become more tightly tied to the world market, the price of red meat would rise and local peri-urban production of farmed chicken would become more important to meet animal-protein demand.

Key Takeaways

- Linking Sahelian ruminant producers who produce the least diseased animals more directly to supermarkets in coastal West Africa would create a shortened high-value red-meat chain, permitting traceability and increasing the responsiveness of producers to consumers' needs.
- Peri-urban rearers of crosses with productive exotic stock, who systematically provide veterinary care to their animals, would be the best producers to integrate into such a scheme.
- Use of privately run, hygienic abattoirs in coastal countries would decrease the risk of contamination at the point of slaughter.
- Use of privately run, hygienic abattoirs in Sahelian countries would broaden the range of consumers because it would then be possible to fly hygienic meat to other destinations.

ANNEX IX: CONSUMER TRENDS AND AWARENESS OF FOOD SAFETY ISSUES

- West Africa's middle-class consumers are more food-safety conscious than less well-off segments of the population. They patronize supermarkets, stores, and eateries for animal products. However, this is not just for reasons of food safety: these modern food outlets also offer convenience and fixed prices.

Photo 47 - Eggs at a Nigerian supermarket



- Demand for heavier, better-fleshed cattle is expanding, and an upper- and upper-middle-class market for superior-quality beef is increasing noticeably in large urban centers in coastal countries. Some butchers in coastal cities are responding to the middle-class demand for tender beef by buying fattened cattle and paying premium prices. Large institutional buyers such as the Société Ivoirienne de Promotion de Supermarchés (PROSUMA) in Abidjan are looking for regular supplies of well-fleshed cattle, but they are not yet linked with Sahel-based cattle-fattening enterprises. This creates an opportunity to structure formal contractual arrangements between coastal buyers and groups of cattle fatteners (Holtzman 2015).
- The recent outbreaks of Ebola in the region, and the scattered resurgence of AI, have piqued consumers' awareness about food safety of meat products. Consumers and market actors are starting to embrace biosecurity measures.
- The consumption pattern in Nigeria in 2009–2010 showed higher consumption of both poultry and red meat the southern part of the country than in the north, with a correlation between areas with higher incomes and the demand for meat.

Educated high-earners consider food-safety issues more than other consumers when they purchase food, and value sanitary production and storage conditions.

- In Burkina Faso and Côte d'Ivoire, middle-class consumers, particularly in large coastal cities, preferred poultry meat from supermarkets due to hygiene but also due to convenience, branding, and packaging.
- The present resurgence of AI causes an increase in consumer awareness of food safety and the embrace of improved biosecurity measures.

- **In Nigeria, an estimated 200,000 people die of food poisoning annually.** “[T]he way out is sensitization and training. We sensitize people about the enormity of the problem and we train them on how to do things properly.”¹⁶
- Nigeria is implementing a national policy on food safety to build capacity and create awareness of the importance of safe food handling, in order to eliminate ‘high risk’ foods from Nigerian markets, improve food-manufacturing procedures, and stimulate food exports from Nigeria.¹⁷
- **Ghana’s estimated loss in tourist revenue of \$800 million annually is largely due to the poor perception of food safety and hygiene.** Earnings from the tourism sector declined from \$2.5 billion in 2012 and \$2.6 billion in 2013 to \$2.1 billion in 2014, down from a projected \$2.9 billion. Poor food-hygiene practices contributed to the decline, as well as the reluctance of local and foreign tourists to patronize street food vendors due to “threatening unacceptable microbial contamination levels.”¹⁸
- **There is a growing shift among consumers in all countries to pay a premium for the perception of safer food.** Consumers pay this premium via the higher retail prices charged by modern supermarkets. There is little quality control of this food, unless national regulatory agencies inspect and certify it, or it is imported from countries with stricter Codex controls.
- **Poor handling of foods and failure to wash hands and food preparation surfaces in restaurants account for over half of all foodborne diseases** in Nigeria. Principal among foodborne diseases are dysentery, typhoid, salmonella, and Ecoli poisoning. There is insufficient regulation and almost nonexistent inspection of eateries and restaurants throughout the region.

Key Takeaways

- Affluent, well-educated, and literate consumers are likely to be aware of food safety issues, and drive demand to improve SPS issues.
- This demographic segment consumes more meat and premium cuts.
- Avian influenza has increased consumers’ concern with food safety in general.
- Consumer groups concerned on food safety are weak or non-existent.
- Poor controls of food safety is a major impediment to increased tourism in the region.

¹⁶ Attributed to Alfred Ihenkurye, a professor of Food Science and Technology (Premium Times).

¹⁷ The EU-funded National Quality Infrastructure project enables the Federal Ministry of Health to start implementing the national policy on food safety (The Guardian 2015).

¹⁸ These findings were presented at a food-safety conference, “Food hygiene, sanitation and safety in the Post MDG Era” (Ghana News Agency 2015).

ANNEX X: COSTS AND TIME OF IMPORTATION AND SPS MEASURES: DJIBO MARKET (BURKINA FASO) TO PORT BOUET (CÔTE D'IVOIRE)

Burkinabé cattle and sheep find markets in coastal West Africa. For cattle, Ghana and Nigeria dominate, while Ghana and Côte d'Ivoire import more Burkinabé sheep. In 2015-16, Nigeria's reduced purchasing power due to falling oil prices sharply reduced its imports of cattle from Burkina Faso in favor of Côte d'Ivoire.

Djibo is a collection market where herders sell their animals to traders. A trader obtains a domestic animal-health certificate from the livestock service that allows him to take a trade herd (i.e., a truckload) of cattle or small ruminants to another destination within Burkina Faso, for instance Ouagadougou. At Ouagadougou, the trader constitutes an export herd from the biggest and healthiest animals from Djibo and other collection markets. He obtains an international animal-health certificate from the livestock service for the export herd, a certificate of origin from the municipality, and an export authorization from the Ministry of Commerce. The veterinarian issuing the international animal-health certificate may briefly examine the cattle visually, but has no veterinary equipment and no procedures for quarantining and carrying out lab tests when he or she has suspicions of disease. The veterinarian plays no effective role in improving the health of trade animals circulating within West Africa. Although rail transport is an option for shipping ruminants to

Figure 2 - Burkinabé cattle exports by destination country (2005–2014)

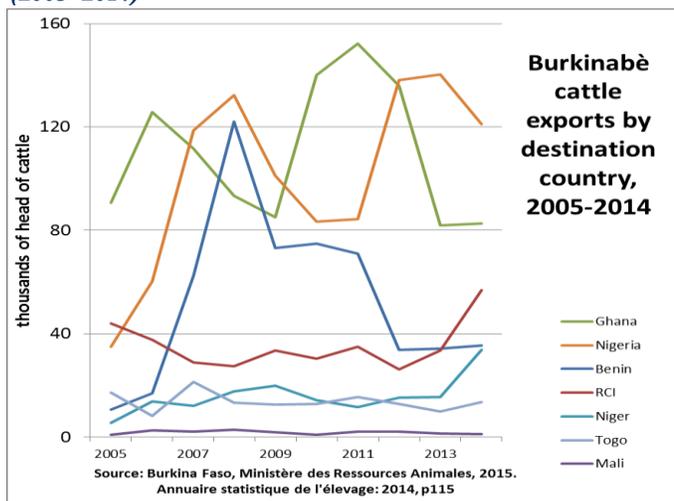
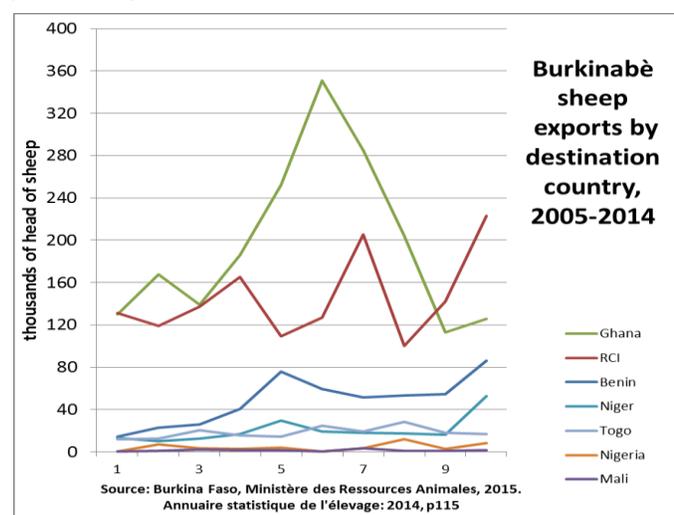


Figure 5 - Burkinabé sheep exports by destination country (2005–2014)



Abidjan, over 90 percent use road transport. As the trader trucks his cattle along the road to the border at Niangoloko, he pays bribes at road checkpoints to officers of the uniformed services (police and gendarmes, but mostly customs).

Table 14 - Costs and time taken for administrative processes linked to exporting cattle from Burkina Faso to Côte d'Ivoire

Location/ route	Ad- minis- trative service	Item	Time taken (min)	Formal cost (FCFA)	Infor- mal cost (FCFA)	Unit	Formal cost per head (FCFA)	Infor- mal cost per head (FCFA)	
Djibo	Livestock	domestic animal-	120		1,000	truck		33	
Djibo-Oua-	Customs	checkpoint bribe	5		5,000	truck		167	
Ouagadou- gou	Livestock	international animal-	150	25,000		truck	625		
	Munici-	certificate of origin		200		head	200		
	Ministry	export authoriza-		200		head	200		
Ouaga-	Mostly	checkpoint bribes,	35		100,000	truck		2,500	
Niangoloko	Customs	FODEL export tax	5	2,000		head	2,000		
	Private	freight forwarding	15		2,000	head		2,000	
	Police	at bridge, leaving	5		5,000	truck		125	
Ouango- lodougou	Livestock	<i>laissez-passer sani-</i>	5	18,000		head	450		
	Private	<i>société de con-</i>	10		125,000	truck		3,125	
Port Bouet,	Livestock	payment to abattoir	5		55,000	truck		1,375	
TOTAL			355				3,475	9,325	
GRAND TOTAL								12,800	

At Niangoloko, the trader pays freight forwarders to handle his interactions with border officials. They make a customs payment on his behalf, called the *Fonds de Développement de l'Élevage* (FODEL), which is effectively an export tax. Sixty percent of the FODEL funds livestock-development activities and 40 percent goes to the treasury. He also pays a bribe to police at the bridge over the river that forms the border between the two countries.

Photo 48 - Burkinabé Cattle Arriving at Ouangolodougou



When entering Côte d'Ivoire at Ouangolodougou, he pays a freight forwarding company (known as a *société de convoyage*) to surrender the international animal health certificate obtained at Ouagadougou and pays for a new Ivorian equivalent, the *laissez-passer sanitaire*. The Ivorian veterinarian issuing the *laissez-passer sanitaire* is no better equipped than his counterpart in Ouagadougou to detect disease or to do anything about it. He plays almost no effective role in stopping diseased animals from entering Côte d'Ivoire. The fee paid to the *société de convoyage* also covers bribe payments at checkpoints mounted by officers of the uniformed services in Côte d'Ivoire, though these are few and unimportant. At his destination, the Port Bouet market adjacent to the municipal abattoir, the trader pays a bribe to the abattoir veterinarians who do not carry out an antemortem visual health inspection of the animals.

The total cost of these administrative procedures is 12,800 FCFA per head of cattle, 27 percent of which is formal and 73 percent of which is informal (or, in the case of the freight forwarders, formal but necessary only because of inappropriate or illegal government procedures). The total time for delays linked to these administrative procedures is almost six hours.

Ministry of Animal and Fish Resources statistics indicate that Burkina Faso exported 344,000 cattle in 2014. (Not all of these went to Côte d'Ivoire but we can take the details gleaned for Côte d'Ivoire as representative of coastal countries in general.) These figures suggest that in that year, a combination of unnecessary procedures and bribery accounted for 3.2 billion FCFA (\$6.7 million). The formal procedures account for another 500 million FCFA (\$1.0 million) of misguided costs that saddle the livestock sector. These procedures include the certificate of origin (not required by ECOWAS SPS regulation for unprocessed primary goods), 40 percent of FODEL (an export tax that discourages livestock exports, particularly legal livestock exports), and the reissuance of the international animal-health certificate in Côte d'Ivoire (in contravention of the ECOWAS SPS regulation). The total cost of these misguided, unnecessary, and illegal charges amounts to about 2.7 percent of the sales price of a Burkinabé bull in the Port

Photo 49 - Burkinabé Cattle Transported in a Truck



Bouet market (400,000 FCFA). In comparison, the brokerage costs for the three sales (Djibo, Ouagadougou, Port Bouet) and trucking costs amount to approximately 3.8 and 6.7 percent, respectively, of the animal's final sales value.

In addition to the explicit costs of these unnecessary procedures, the delays pose a tacit cost: they slow down the rotation of the traders' capital and make business less profitable. However, the total of less than six hours of delays over the course of a livestock-trading cycle of about three weeks is not of great importance. In contrast, butchers in Port Bouet always buy on credit and the trader waits for approximately a week to recuperate payments from various butchers who buy animals from his truckload. Any attempt to increase the efficiency of regional livestock trading should tackle this much more significant cost.

The issuance of the certificate of origin and the reissuance of the animal-health certificate are illogical. They add to the trader's cost and should be eliminated. However, they are only a part of the administrative inefficiency associated with the regional livestock trade. This, in turn, is not a large fraction of the overall cost of doing business. The underlying institutional corruption and inefficiency that allow these two administrative anomalies run deep and generate extra costs for the entire business community. They should be resolved, but they should not be the focus of attempts to improve regional trade in ruminants, chicken, and maize.

The one issue that has public-health implications, and that is this report will pursue elsewhere, is the absence of an antemortem health inspection. This is a standard abattoir protocol whereby the veterinarian eliminates suspect animals from slaughter. This lapse in biosecurity is not unique to the Port Bouet abattoir.

Key Takeaways

- Redundancy in customs and SPS documents lead to inefficiency and extra costs, but form only a fraction of the overall cost of doing business.
- Antemortem inspection is absent at critical points in the value chain.

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