Regulations for safety of animal source foods in selected Sub-Saharan African countries: Current status and their implications

Mohammad A Jabbar
and
Delia Grace

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International Livestock Research Institute
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1 Background, objectives and methodology

Safe food is generally defined as food free of hazards[1] to human health. Safety can be seen as an aspect of food quality, which encompasses all attributes of food (such as freshness, nutritive value, taste, origin etc) that influence its values to consumers. However, because food safety is difficult to directly verify, market failures are more common than for other attributes. Moreover, the consequences of food safety failure are of more importance to public health than deficits in other quality attributes such as taste or origin. Hence, it is often convenient to separate food safety from more general quality issues (Unnevehr & Hirschhorn, 2000). Recently food safety has become an important issue globally with different aspects in the developed and developing world.

In the developed world, food standards have evolved in each country in parallel with general economic development, changes in consumer demand, and intensification of production and marketing systems. Historically, developed country food safety systems often had their genesis in consumer outrage, such as that raised by 'The Jungle'. Upton Sinclair's (1906) raw account of slaughterhouses in Chicago led directly to the establishment of the Food and Drugs Act. Yet, after decades of relative complacency, a number of factors have heightened concern about food safety in recent years (World Bank, 2005). These include: highly publicized food safety scandals (e.g. 'mad cow' disease, *Eshcherichia coli* in beef and sprouts); increased scientific knowledge and ability to detect pathogens and to link illness in people to pathogens in food; concerns about bio-terrorism through food; and reduced consumer trust in agro-food industry, regulation, and application of science and technology to food production (e.g. use of growth hormones and transgenic foods).

Despite high levels of concern, experts consider that food in developed countries is of historically unprecedented safety. On the other hand, in many developing countries, public food standards either do not exist for most food or have been developed following developed country norms and are irrelevant for the smallholder system of production, informal marketing and the level of consumer demand. Moreover there is a significant gap between policy and practice due to lack of appropriate regulations, infrastructure and manpower capacity for enforcement. Food safety has been considered a luxury in countries which have not attained food security, however, the last few decades have seen concern about food safety in developing countries. This concern has had several drivers: better understanding of the impact of food-borne disease; a growing middle class which shares the values of developed countries; developing country interest in exports.

Animal source foods are of especial concern from a food safety perspective for several reasons. Over 60% of human pathogens are shared with animals and many of these can be transmitted by animal source products; moreover, animal source products often provide good conditions for growth and survival of pathogens.

[1] Food safety hazards are considered as biological, chemical or physical entities with potential to harm human health and are distinguished from food safety risks, which are a combination of the negative health impacts of a hazard and the probability of their occurrence.

Traditional smallholder production and marketing systems are generally ill equipped to respond to the emerging demand for food safety and so they miss the opportunity to improve income and livelihood from an expanding market. This gap is being filled by emerging food supply chains involving supermarkets, contract farming and other institutional arrangements. Supermarkets in developing countries sometimes may import high value commodities like meat and milk rather than buy from domestic smallholder producers due to poor quality and possible health hazards. Supermarkets may also take little interest in helping smallholder producers and traders to improve the quality and safety of their products. Moreover, in the absence of adequate food safety regulations and monitoring, such outlets themselves can be a source of hazards.

Most decision-making over food safety is driven by public health concerns and not informed by insights derived from other disciplines. As a result management does not take into account multiple objectives such as income generation, environmental sustainability, nutrition and empowerment of women. This is both inequitable and inefficient. It is inequitable because the interests of poor, smallscale farmers are not considered and inefficient because the great majority of the risk management in informal markets is done by the value chain actors themselves. Marginalizing them from food-safety decision making decreases the likelihood of their participation in high value markets.

In order to address food safety concerns in the developing countries from both domestic and international market perspectives, both public and private sectors need to take appropriate measures. However, in order to take specific measures by any country in the above areas, a clear picture is needed about the existing or baseline situation on food safety status or food related health hazards, food safety regulations and their implementation. Lessons from experiences in the formulation and implementation of regulations in other comparable countries may be helpful for developing appropriate strategies.

From this perspective, an analysis of the status of food safety regulations and implementation was conducted in six sub-Saharan African countries – Ethiopia, Ghana, Kenya, Mozambique, South Africa, and Tanzania. The objective was to develop an up-to-date and user-friendly summary of the status of food safety regulations and implementation in each country. The specific focus of the study was on food safety governance (stakeholders, regulations, implementation) taking into account major livestock product value chains; reported and perceived food safety problems; and national priorities around food safety. The study aimed to present the food-safety system and within this help identify the key constraints and areas where research and development interventions could work to improve the safety of food and its contribution to livelihoods and nutrition of the poor.

The study was led by ILRI and implemented in partnership with national research teams in the study countries. The national research team in each country was composed of key experts from research, education, extension and regulatory organizations. A common approach to the study was developed by the core research team at ILRI in consultation with the country research teams. These were further refined by holding an inception workshop at which all the country teams were represented to discuss the objectives and methodology of the study. The approach finally adopted included review of the food and food safety policies, regulations related to food safety especially for livestock products, and assessment of public health hazards and food safety

problems prevailing in the country based on a number of criteria. Data were collected from published and unpublished literature and statistics, and through a structured questionnaire survey which was administered by holding consultation with key stakeholders in public and private sectors related to assurance of safe livestock products such as ministries of agriculture, livestock and health, other specialized agencies such as dairy and meat boards, and food standard authorities, livestock production and processing companies or enterprises, regulatory and inspection authorities, research and extension organizations etc. Both formal consultations in workshops specially organized for this purpose and key informant interviews were conducted (for details see, Kang'ethe et al., 2011; Kurwijila et al., 2011; Zewde, 2011; Mohammed-Alfa and Tano-Debrah, 2011; McCrindle et al., 2011; Munguambe and Hendrickx, 2011).

In section 2, some basic characteristics of the livestock sector in the study countries are summarized to provide the context for assessing the current status of food safety. In section 3, policies and regulations related to safety of livestock products in each country are summarized. In section 4, the current status of food safety with a focus on livestock products is assessed on the basis of a number of criteria. Summary and conclusions are presented at the end.

2 Some features of the livestock sector in the study countries

The livestock sector in the selected countries have some common and some dissimilar features that have implications for the types of health hazards that may exist and the ways they can be managed or controlled. The selected countries represent geographical as well as environmental diversity e.g. Ethiopia and Kenya located in East Africa have over 50-70% of their landmass under highland where livestock may be less subject to disease burden but both the countries have a significant portion of their landmass under arid/semi-arid lowland environment where only pastoral livestock production is pursued under severe feed, water and disease constraint. Tanzania, another East African country, also has a small area under highland and most of the area under subhumid and semiarid environment. South Africa embraces a diversity of landscape under semiarid climate. Neighbouring Mozambique also has mainly semi-arid and sub-humid environments. Ghana, a west African country, has a coastal humid zone in the south of the country that is not very suitable for livestock production except some trypanotolerant breeds of cattle and goats but sub-humid and semi-arid north of the country has less of that problem.

The countries are also diverse in terms of the level of economic development, system and scale of production and marketing, size and importance of livestock production, consumption and trade, The livestock sector contribution to nutrition, GDP, employment and export earnings vary widely between countries but production and marketing of livestock and livestock products provide livelihood for a large number of people. For example, in Kenya, 600,000 farm households are engaged in smallholder dairy production alone and another 350,000 households are engaged in various dairy marketing activities.

Smallholder livestock production and informal marketing systems involving short local supply chains with few intermediaries or a slightly longer chain connecting large urban centres through several intermediaries dominate ruminant livestock sector in these countries as elsewhere in Sub-Saharan Africa. Only South Africa has a large commercial ruminant livestock industry involving ranches for production and large processing enterprises for marketing, and Kenya also has a small commercial beef production sector. In South Africa, about one third of the population is dependent on subsistence production of livestock products and about 50% of total food in low income rural areas comes from informal production and sales. The remaining portion of the population is served by the formal commercial sector (including supermarket chains) which also almost exclusively supplies the exported products. In Kenya, Uganda, and Tanzania, raw milk produced in the smallholder sector accounts for an estimated 80%, 90%, and 98% of marketed milk in each country respectively, formal channels including supermarkets handle the rest (Omore et al, 2002). Even in urban areas, wet markets are the principal sources of livestock products for most households.

Marketed surplus and market off-take rates for live animals and other livestock products are low in all the countries except the commercial sector in South Africa. For example, in Ethiopia, average livestock holding in smallholder mixed faring systems in the highlands is 3.7±3.6 heads of cattle and 3.6 ± 6.9 heads of sheep and goats. Net commercial off-take rates from these systems is less than 10% of average stock for cattle and less than 20% for sheep and goats (Table 2.1). Live animal and meat export originate in the pastoral lowlands while the smallholder mixed farming systems serve the domestic market. In smallholder systems, marketed surplus for

chicken is 7%, milk 17%, butter 39%, cheese 14%, and eggs 64%. (Zewde, 2011). These are typical of smallholder systems in other countries (Negassa and Jabbar, 2008). In case of pig, poultry and eggs, commercial production dominate in most countries though in Ethiopia, Mozambique and Ghana, scavenging poultry is still a significant supply source for the market.

Table 2.1. Gross and net annual commercial off-take rates of cattle and shoats in Ethiopia estimated from different data sets

Reference year	Sample size	Gross off-take rate (%)			Net off-take rate (%)		
		Cattle	Sheep	Goats	Cattle	Sheep	Goats
1999-2000	1054	16	34	30	8	22	18
2004-05	458557	17	19	15	7	7	8
2003-05	451	11	10	11	9	6	7

Source: Negassa and Jabbar (2008)

South Africa is the most advanced economically compared to the other five countries Available statistics on production, consumption and trade in livestock products are problematic for interpretation because of lack of conceptual clarity (see Table 2.2). For example, it is not clear if meat production figures represent only slaughtered animals or include exported live animals; it is not clear if milk consumption figures include only liquid milk consumption or liquid milk equivalent of all types of milk products. Subject to these conceptual limitations, it appears that Ethiopia and Tanzania are self-sufficient in most products, and small net exporters in a few products. Kenya is a net importer of beef and poultry and a net exporter of sheep/goat meat and eggs; South Africa is a net importer of all major meats and a net exporter of eggs and milk. Ghana is a net importer of nearly all the major livestock products. The nature of trade also varies between the countries. While in some case like South Africa, most trade in livestock products (both export and import) is handled through formal channels, informal cross-border trade dominates in case of other countries e.g. live animal trade between Kenya and Ethiopia or between Kenya and Tanzania or between Ghana and the countries in the Sahel.

Even though international trade, especially export, is small but important for a number countries, prevalence of some important diseases, especially occasional outbreaks of transboundary diseases, jeopardize export as well as domestic market. For example, outbreak of Rift Valley Fever in Kenya during 2006-07 led to ban on import by Middle East countries and boycott of meat and milk products by domestic consumers so smallholder producers suffered. Also outbreak of HPAI in 2007 led to boycott of poultry products by domestic consumers but outbreak of Aflatoxin in animal feeds and milk during 2004-07 escaped any negative effect due to lack of consumer awareness even though consumption of affected products might have created public health problems of unknown dimension. Ethiopia also suffered from import ban from the Middle East following outbreak of Rift Valley Fever on a number of occasions and domestic price fell so that smallholder producers suffered.

Table 2.2. Volume of production and self-sufficiency ratio (as a percentage of consumption) of major livestock products in the study countries, 2008/2009

Commodity	Ethiopia	Ghana	Kenya	Mozambique	South Africa	Tanzania
		Production	**000 MT**			
Beef	380.0	19.5	365.0	7.7	6630.0	246.3
Sheep/goat meat	145.0	32.0	80.7	1.0	956.0	40.9
Poultry	46.3	31.9	24.0	18.8	8970.0	45.4
Pork	na	17.0	17.2	1.0	1462.0	12.9
Eggs	37.5	na	69.0	3440.3	3390.0	35.4
Cow milk	1350.0	na	4230.0	1.5	22330.0	935.0
		Self-sufficiency	**ratio**			
Beef	105	49	76	70	94	±100
Sheep/goat meat	103	85	115	54	76	±100
Poultry	±100	26	44	68	85	±100
Pork	na	76	±100	64	91	±100
Eggs	±100	<100	149	26	106	114
Cow milk	?	<100	136?	17	138	120?

For South Arica, cow milk includes milk products; in other cases, only liquid milk

Source: Kang'ethe et al. (2011); Kurwijila et al. (201); Zewde (2011); Mohammed-Alfa and Tano-Debrah (2o11); McCrindle et al., (2011), Munguambe and Hendrickx (2011).

3 Policy, regulations, infrastructure and manpower for food safety

3.1 Policy and regulations

In the developed countries access to safe food is considered a natural right of every citizen and assurance of safe food is equally considered an obligation of the government and businesses. Such rights and obligations are formalized in various public policy and business policy statements and in government regulations and company codes of practices. In most developing countries the situation may not be as simple and straightforward. Some countries may have explicit public policy statements supported by regulations for assurance of safe food, others may have inadequacies in this respect. Most production and marketing is in the hands of small farms and businesses, large scale commercial operations are few, so their codes of practices are not as advanced and standard as in the developed countries.

The situation in the six study countries with respect to policy statement and regulations on food safety, especially for livestock products, is not similar. In South Africa, Ethiopia and Kenya, assurance of safe food is explicitly stated or implied in public policy documents and these are supported by appropriate legislations or acts. For example, in Ethiopia, assurance of safe food is explicitly stated or implied in the national agricultural and rural development policy as well as in the national health and nutrition policy proclamations (Zewde, 2011). In Kenya the right of citizens to safe food is enshrined in the country's constitution. A number of national policy documents such as the National Recovery Strategy 2003, Strategy to Revitalize Agriculture 2005, National Livestock Policy 2007, Strategic Plan on Creation of Animal Disease Free Zones 2007, the draft National Food Safety Policy 2010, and the National Dairy Development Policy contain explicit or implied statement about assurance of safe food for the citizens (Kang'ethe et al., 2011). In Tanzania, food safety is implied in the Agriculture Policy 1997 and the Livestock Policy 2006, the cornerstone of which is to achieve food and nutrition security for the nation and commercialization of smallholder agriculture in an environmentally sustainable manner. Food safety is also implied in the food and nutrition policy for Tanzania prepared by the Ministry of Health in 1992 (Kurwijila et al., 2011). While in Ghana and Mozambique, there is no explicitly stated or approved food safety policy though various government bodies are empowered through legislations or acts to deal with food safety issues (Mohammed-Alfa and Tano-Debrah, 2011, Munguambe and Hendrickx, 2011)

The regulations addressing food safety in the six countries vary in scope, form and content, as well as in terms of implementing authority or mechanism. These also have been presented somewhat differently by the country teams , so situation in each country is discussed followed by a brief summary of key similarities and differences.

3.1.1 Ethiopia

The main government organs responsible for food safety in Ethiopia are the Ministry of Health (MoH), Ministry of Agriculture and Rural Development (MoARD) and the Quality and Standardization Authority of Ethiopia (QSAE). The MoARD is empowered by proclamation No.267/2002 to control epizootic and zoonotic diseases through inspection of any premise or areas where animals, animal products, animal by-products are kept, taking samples from animal

products and by-products for identifying diseases or disease causing agents. The Ministry can establish quarantine stations, entrance and exit posts to control the safety of food of animal origin imported and exported into and outside the country, issue international zoo sanitary certificate for the food commodities exported and requires also the same for imported food products.

The ministry has drafted a number of regulations in 2010 to enforce the above. The regulation on prevention and control of animals diseases describes the procedures of disease notification of livestock disease outbreaks, prevention and containment of epizootic and zoonotic disease, animal testing, quarantine procedures, creation of disease free zones and containment of fish and bee diseases. The proposed regulations on animal identification and movement control outlines the procedures of premise (farm) registration, identification of food animals, recording and tracking of food animals. Regulations on animals, animal products and by-products describes the procedures of quarantine, vaccination, action to be taken in case of disease occurrence and lists the requirements to be met in export and import of food of animal origin.

The MOARD is empowered by Proclamation No.274 of 1970 and the amended Meat Inspection Proclamation No.81/1976 to carry out meat inspection in export and local abattoirs. Regulation No.428 of 1972 has been promulgated to enforce the above proclamation. The Regulation describes in detail the facilities and accommodations required to undertake ante mortem inspection, procedures of post mortem inspection, and lists judgments on a number of diseases diagnosed during ante mortem and post mortem inspection. Very recently, the ministry has drafted a new meat inspection and hygiene proclamation and submitted the same to the Prime Minister's Office to be endorsed by the parliament. The act requires the registration of abattoirs and slaughterhouses, defines the duties and responsibilities of meat inspectors. The new regulation envisages to control the safety of exported and imported milk, eggs, honey and certification procedures, which was not considered in the previous proclamations.

The meat inspection proclamation explicitly states that meat inspected should display stamps attesting that the carcass has been passed as fit for human consumption. In 45% of the cases stamps are laid by controlling authority (meat inspection service). No inspection of food is carried out at wet markets. No premium price is paid for carcass or food items displaying stamps. No quality information is written on the packages of food and consumers are not aware of food safety logos.[2] Food of animal source especially uninspected beef, sheep and goat meat enter the formal market in butcheries. There are no chilling/cooling facilities in butcheries, but there are cooling facilities in shops of dairy cooperatives and fish shops in bigger cities and towns. All carcasses of sheep and goats are sold within a day, but the sale of beef takes more than two days. Beef that is not sold within a day or two are sold to inns and restaurants at lower prices. Slaughter animals in rural areas are sold on per head basis (eye estimate) without weighing but in urban areas, in ranches and feed lots, food animals are sold on the basis of their body weight.

The Federal Ministry of Health has amended the Public Health Proclamation No.200/2000 and has recently enacted Proclamation No. 661/2009, which enables it to control the safety and quality of food. The new act entitles the Ministry to set food standards, issue licenses to trans-

[2] This may not be fully correct. A survey conducted in Addis Ababa on indicators of meat and milk quality and safety showed that consumers are aware of meat inspection system to certify quality and are willing to pay more for such certified meat (see, Jabbar and Admassu, 2010).

regional food companies, control the import, export, distribution, storage of food and control the quality of food laboratories. According to the new proclamation, the Ministry can issue, renew, suspend and revoke licenses for food processing plants, food importers, and exporters. The Ministry can initiate policies and legislations to strengthen food safety, undertake post market surveys to ensure food safety, dispose expired foods and control illegal trade.

The Ministry will appoint inspectors to implement the provisions of the proclamation. The appointed inspector shall have the power and duties to enter and inspect any food establishment. The act prohibits the production, sale, distribution of food without permit. No raw food materials, additives, packaging materials shall be put to use unless it complies with national and international food safety standards. The law prohibits the engagement of persons infected with communicable diseases to work in food plants or food catering establishments.[3] Imported and exported food items shall be accompanied by food safety certificate. In addition to this the Ministry has published manuals and guidelines on Food Hygiene and Safety.

The Quality and Standard Authority of Ethiopia (QSAE) is also empowered by proclamation 102 /1998 to set food standards. The QSAE has developed a number standards related to quality assurance and the safety of food of animal origin, which are supposed to be followed by all stakeholders – implementing authorities and compliers like producers, market agents, industries.

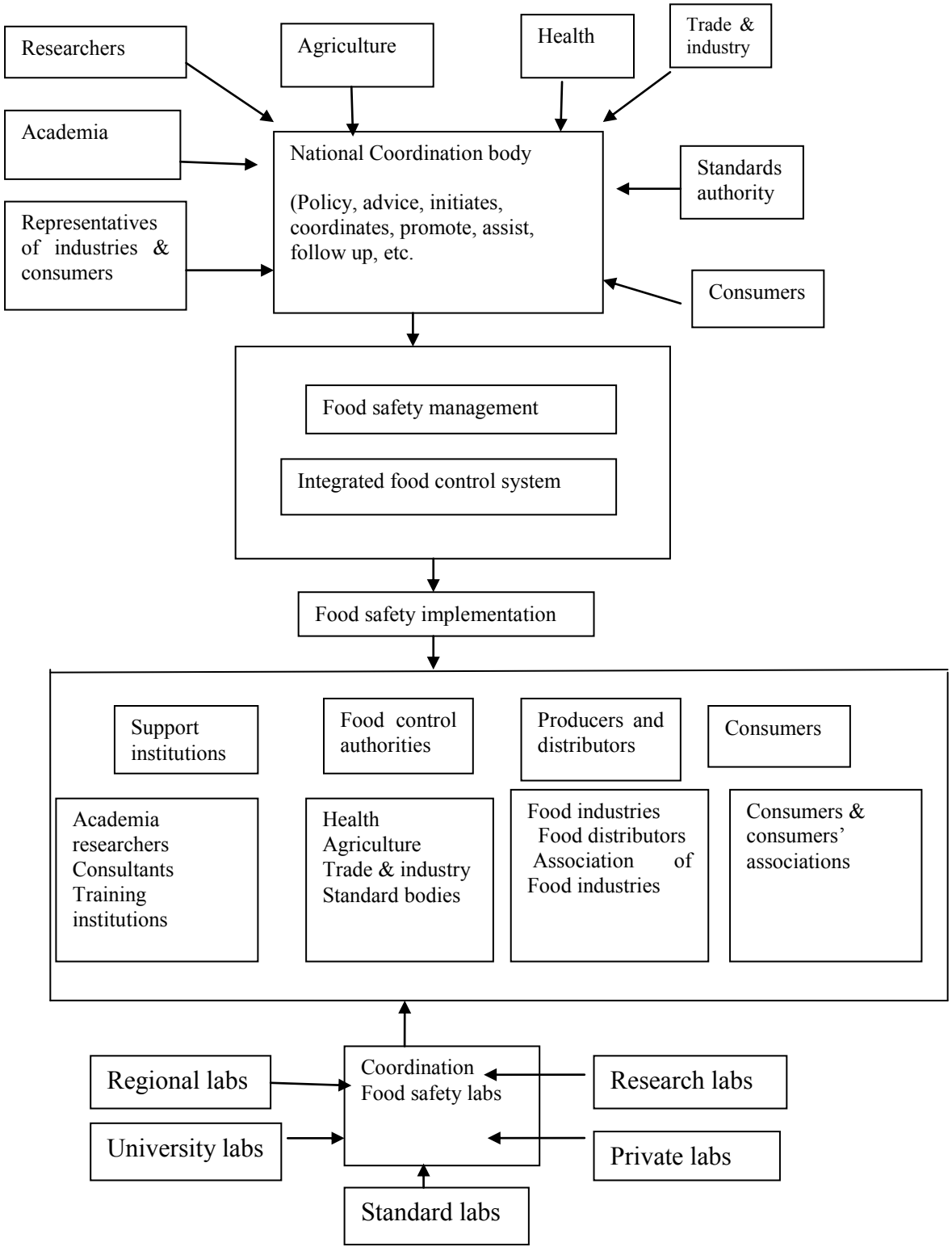
Thus, there are few acts with wide scope to deal with food safety issues though the actual number of implementing agencies is unclear from the acts as each ministry may have several agencies on the ground with often overlapping mandates to implement the provisions in the legislations. There are also overlaps between the mandates of MOH and QSAE. There is little close cooperation and co-ordination between the three institution which has resulted in duplication of works, wastage of the meagre human and financial resources. An unsuccessful attempt was made to establish a Technical Committee to coordinate and liaison the food safety activities carried out by different ministries and agencies, then a National Food Safety Council was established, with members drawn from the public and private sectors (Figure 3.1). Its roles and responsibilities include the following:

- Establish and coordinate an effective food safety assurance system.
- Formulate effective food safety policy and strategy and follow up their approval and implementation.
- Establish and strengthen food safely information, education, communication, training among regulatory bodies, inspection authorities, institutions, producers and consumers.
- Strengthen the food safety inspection, monitoring and epidemiological studies.
- Establish food laws and update food safety regulations and establish food safety fund.
- Harmonize the national food safety system with international requirements.
- Establish intuitional arrangements for effective food safety management
- Establish and strengthen risk assessment capacity and research in food safety.

The council is yet to be implemented but its complex structure and multiplicity of membership and objectives may keep it on paper with little practical application.

[3] Consumers also consider the cleanliness and hygiene of the premise (meat and milk shop) as well as of staff as indicators of meat quality and safety and do pay different prices based on these characteristics (see, Jabbar and Admassu, 2010)

Figure 3.1. The proposed Ethiopian Food Control system



Source: Zewde (2011)

3.1.2 Ghana

The Food and Drug Act 1992 (PNDC L305B), and its amendment Act 1996 (Act 523), has been set up by the Food and Drugs Board of Ghana, giving it the mandate to regulate the manufacture/processing, importation, exportation, packaging, storage, transportation, distribution and sale of all foods including livestock products.

This act contains articles prohibiting the sale of unwholesome, poisonous or adulterated food, deception of consumers; sale of sub-standard goods; sale of food not of nature, substance or quality demanded of purchaser; manufacture of food under supervision of untrained personnel; sale of food under unsanitary conditions and sale of foods unfit for human consumption. The amendment act 523 has expanded the definition of food to include animal feeds thereby further improving the regulation of the quality and safety of animal-source foods.

The Diseases of Animal Act 1961 (Act 83) requires owners of animals suspected to have died of diseases or to be suffering from diseases to immediately notify the nearest veterinary authority and keep such animals separate from all other animals not suffering from the disease until the disposal instruction has been given by the veterinary authority. The act also empowers veterinary officers to inspect all animals meant for slaughter. These and other powers given the veterinary officers under the act are meant to control and avoid the spread of animal diseases and thus protect the health of consumers since such animals are sources of food.

The Animals (Control and Importation) Ordinance (Cap 247) prohibits the importation of animals into the country unless certified by a veterinary authority that they are free from diseases.

The Veterinary Surgeons Law 1992 empowers veterinary doctors to handle treatment and welfare issues of food animals to guarantee safety of food products derived from them. By this, veterinary doctors prescribe medicines for food animals, carry out treatment of animals and supervise vaccination exercises. This is to ensure that foods derived from animals do not serve as vehicles for pathogens and do not contain drug residues.

Local Government Act 1961 (Act 54); amended 1992 (Act 462) empowers local government bodies (Metropolitan, Municipal and District councils) to build, manage and license slaughter houses; to regulate the slaughter and provide for the inspection of animals intended for food for human consumption. These powers were expanded in 1974 to provide for the inspection of all meat and fish among other things intended for human consumption.

Standards Decree 1967 (NLCD 199) empowers the Ghana Standard Board (GSB) inter alia to regulate the promulgation of standards for all goods including foods. Standard decree 1973 (NRCD 173) empowers the GSB to prescribe the treatment, processing and manufacture of goods and also prescribe the standards of composition, purity and other properties of goods including food. NRCD 173 was subsequently amended by AFRCD 44, further empowering the GSB to prohibit the sale or manufacture of food in the national interest and to prohibit the importation into Ghana of foods which has not been certified by the GSB as complying with its standards.

A Food and Drugs Bill is pending before the legislative body. The bill when passed will give authority to the FDB to register premises to be used for slaughtering of animals using prescribed methods, instruments and appliances, and to inspect slaughter and butchery facilities to determine whether they are suitable for these purposes, to give prior approval to vehicles before they can be used for the conveyance of meat or meat products. There is also a draft meat inspection law, 1999, which identifies the veterinary services as the best suited institution for the control of meat hygiene including meat inspections. This draft law prohibits the importation of meat and meat products unless the product bears a certificate testifying that the product meets the specification by the appropriate authority in Ghana. Similarly, exports are also prohibited unless certified by the director of veterinary services that the products satisfy the prescribed standards set by the Ghana Standards Board (GSB).

Meat inspection is therefore an area where there is a serious overlap in functions of Veterinary officers/meat inspectors of the MOFA and the Health Inspectors of the Municipal Metropolitan District Assemblies (MMDAs) of the MLGRD. The meat inspection function has therefore been a source of conflict between the Veterinary Services Officers and the Environmental Health Department Officers of the Metropolitan, Municipal and District Assemblies. There is a draft bill on meat hygiene which when passed may resolve these problems.

There is also the duplication of functions with respect to destination assessment of food products by both GSB and FDB. This contributes to delays associated with clearing food products at the entry points.

3.1.3 Kenya

There are many stakeholders and actors in both public and private sectors who are involved in the quality and safety of animal source foods. Among the public sector players, the majority are the same agencies implementing various acts, while in the private sector, the players are dealing mainly in milk and milk products processing, meat and meat products (beef, pork and fish), Other than those involved in processing and marketing, there are nongovernmental and professional bodies that are advising farmers on better production, processing and marketing practices. Private laboratories are active in offering analytical services thus complimenting services offered by government laboratories.

Among the public sector agencies, the following have exclusive or inclusive role in food quality and safety assurance (Kang'ethe et al.,2011). The regulations or acts through which they perform these roles are summarized in Appendix 1.

Ministry of Public Health & Sanitation : It is the central food safety and quality authority in Kenya. It conducts its activities under the Public Health Act and the Food, Drugs and Chemical Substances Act. In addition, the ministry operates under the Meat Control Act, on abattoirs and meat inspection. It discharges its food control duties through a network of over 8,000 health technicians deployed at the district and municipal levels. Other responsibilities include the

issuance of export health certificates for food exporters, medical examination of food handlers and licensing of food premises.

Ministry of Livestock Development (Department of Veterinary Services) : The Director of Veterinary Services is empowered to control animal diseases and pests by various legal statutes namely:_Animal Diseases Act (Cap 364), Cattle Cleansing Act (Cap 358); Rabies Control Act (Cap 365), Branding Act (Cap 357), Crop and Livestock Production Act (Cap 321), Veterinary and Surgeons Act (Cap 366), Meat Control Act (Cap 356) and Pig Industry Act (Cap 361). The Department of Veterinary Services also oversees the safety and quality of animal feeds under the Fertilizer and Animal Feeds Act (Cap 345).

Ministry of Fisheries Development: The Fisheries Department is in charge of inspection and auditing of fishing vessels, landing sites, processing establishments, monitoring compliance with Hazard Analysis and Critical Control Point (HACCP) plans along the value chain, and certifies fish under the Fish Quality Act (Cap 378). The safety and quality of the local fish supply, however, are under the jurisdiction of district public health officials and municipal councils. Although legally subject to the same regulations and guidelines as fish for export, the safety and quality of fish for local consumption receives limited attention from the authorities.

Kenya Bureau of Standards (KEBS) : KEBS was established in 1974 through an Act of Parliament. Its mandate is to develop, implement and keep custody of standards. In addition KEBS adopts or adapts codex food standards. Other activities include preparation and dissemination of information on quality and safety, technical assistance to achieve compliance of product and/or process standards, assistance in attaining ISO certification (ISO 9000, ISO 14000, ISO 22000 etc) and certification to standard mark of quality to processors and manufacturers.,

KEBS is involved in the harmonization of various standards in the East African Community (EAC) and Common Market for East and Central Africa (COMESA) to facilitate fair food trade.

Kenya Dairy Board (KDB) : KDB is a statutory organization under the Ministry of Livestock Development mandated to regulate, promote and develop the dairy industry. It undertakes licensing of dairy premises, monitoring the safety and quality of milk and milk products and inspecting dairy plants/premises. It's also involved in the issuance of permits to import/export dairy products.

In terms of traceability, the Kenya Dairy Board has entered into a private-public partnership with Agri-trace Kenya Ltd to develop and implement a traceability programme for milk and milk products. The pilot phase is ongoing.

Kenya Meat Commission (KMC) : KMC was established in 1950 by Parliament as an oversight body for the slaughter of cattle and small stock, processing, chilling, freezing, canning or storing beef, mutton and other meats (excluding poultry) for export and for the local market. At the moment, it is concentrating on the manufacturing of cattle, goats and sheep meat and meat products as it awaits for eventual privatization.

Local Government Authorities (LGAs) : The role of the LGAs within the Kenyan food control system is exemplified by the Nairobi City Council Public Health Office. The Health Inspectorate

is part of the Department of Environmental Health of which the Food and Water Control Unit is charged with the tasks of monitoring food and water safety issues. The councils have qualified public health officers/technicians, some of whom have been seconded to the councils by the Ministry of Public Health and Sanitation. The councils operate under the Public Health Act and the Food, Drugs and Chemical Substances Act.

Pest Control Products Board (PCPB) : The PCPB was established under the Pest Control Products Act. It is not directly involved in food safety. However, the regulation of pesticide usage is under its jurisdiction and pesticides have potential safety implication in animal source foods.

Self regulation mechanisms: Processors in some of the animal products value chains are organized into member associations such as the AFIPEK, which has developed its own internal standards, slightly more stringent than the statutory standards. The members are obliged to adhere to these standards creating a self regulatory mechanism. The Kenya Dairy Processors Association (KDPA) has also been revived and is expected to contribute to self regulation in the sector. In the red meat sector this aspect is still in the formative stages

However, some other acts that have indirect role in the safety of livestock products such as acts governing transportation of food products, quarantine of live animals etc, might have been left out of the list. Yet it seems that there are multiplicity of acts and implementing agencies with overlapping mandates, which demand high degree of coordination and collaboration, but that is often missing (Kang'ethe et al., 2011).

3.1.4 Mozambique

There are as many as thirteen institutions involved in one or more aspects of food safety regulation and implementation in Mozambique. Appendix 2 gives an overview of the different institutions, their mandate and their location in the food chain. Unfortunately there is no lead agency responsible for the entire food safety system although the Department of Environmental Health at the Ministry of Health seems to lead the food safety enforcement. But several public institutions have similar roles and overlapping responsibilities in the food safety system and there is no clear coordination mechanism among them. An example of apparent overlap of responsibilities is given below:

The ministry of Industry and Commerce through its department of inspection, conducts testing of food and agricultural products at entry points. It is not clear how this relates to the testing conducted by the Department of Agricultural Services from the Ministry of Agriculture whose mandate is the inspection of food from animal and plant origin. Within the Ministry of Agriculture there are several departments working on food safety that have conflicting missions. Some of them promote improved agricultural productivity while others enforce measures.

The main food laws in Mozambique are comprised in the *Colectânea de Legislação no Âmbito da Higiene Alimentar* from 1994. Some relevant ministerial decrees included in this compilation document are:

- Ministerial Order No. 80/87 approving the hygiene regulation on food imports.
- Ministerial Order No. 88/87 approving the regulation on pesticides.
- Ministerial Order No. 51/84 approving hygiene regulations for food handling establishments.

The emphasis of the food regulation is on the internal food business rather than on the export markets, although food for export is more likely to be inspected than that for internal consumption. This is most evident in the fisheries sector, were a comprehensive legislation and appropriate inspection schemes have been developed and established with a view to comply with the requirements of the EU markets.

Generally the food laws have not changed much in the past 10 years although minor changes have taken place:

- There is a proposal of updating the existing legislation on crimes against public health and related to food hygiene (Law no. 8/82 of 23 June). The proposal was developed under the implementation of a Food Safety project implemented by UNIDO with focus to public sector institutions.
- The legislation regarding the fisheries sector is also under review, aimed at targeting the export requirements of the EU and other international markets.
- A consumer's protection law has recently been enacted by the Mozambican Parliament, but it awaits promulgation by the President of the Republic, followed by its regulations.

For enforcement of regulations, areas in the food chain that undergo regular food safety inspection are:

- Commercial farms
- Collection sites (e.g. milk collection, egg collection)
- Abattoirs
- Exporters of processed animal source food
- Food processing sites
- Markets
- Shops
- Eating places/restaurants.

Areas in the food chain that escape regular food safety inspection are:

- Smallholder farms
- Informal slaughter sites
- Transporters of unprocessed animal source foods
- Transporters of processed animal source foods
- Street food vendors

The main activity is process and product inspection and is carried out by different agencies: CHAEM; DCA-IIAM; DI-MIC; DNSV, INIP, SPP and the municipal authorities. In general, food from animal origin intended for human consumption is more frequently inspected than food from plant origin (fruits and vegetables). None of the government agencies listed earlier use risk analysis in their day to day work despite that training courses have been provided by Codex and

OIE. As outlined above, different agencies have different responsibilities in this regard. There has been little emphasis from the governmental inspection services in enforcing regulations directed to agricultural products. The law states that meat must display a stamp from inspection by a certified inspector. This is almost always the case for meat from the abattoir, however this meat represent less than 10% of the meat consumed in the country, which is slaughtered and sold informally. The meat from the abattoirs is sold at butcheries and is estimated to be around 60% more expensive than the meat sold at informal markets where no inspection takes place.

According to the World Health Organization's Food Safety and Nutrition Country profile for Mozambique, some of the food safety concerns identified in exported products from Mozambique are:

- Microbiological contamination of seafood;
- Contamination of peanuts with aflatoxins;
- Fruit fly infested bananas;
- Filthy split pigeon peas.

Regarding the import of agricultural products, the main food safety concerns are:

- Outdated products;
- Poor quality products;
- Counterfeited products;
- Informally imported food often doesn't undergo food inspection.

Companies exporting produce to Europe in particular have acquired certification under EurepGAP/GlobalGAP Standards and they are covered regularly by foreign inspections. One Horticulture company operating in Mozambique named Companhia do Vanduzi SA has certification on BRC Global Standard Food and is currently exporting to the EU. There is not a single company certified under the food safety management system (ISO 22000). In addition, no laboratories or calibration services have been accredited under the ISO 17025 standard.

3.1.5 South Africa

In South Africa, the objective of food safety regulation is to ensure the delivery of a safe product to the consumer, either via local or export supply chains. Food safety is regulated by a variety of Acts, which include a comprehensive set of focus point or activity or function along the chain from farm to fork. A generic description of focus points at major stages of animal product supply chains are shown in Table 3.1.

A large number of acts have been promulgated by the government to deal with food safety in general which also cover food of animal origin, but there are specific regulations to address aspects of animal source foods. Regulations are targeted to various focus points, a detailed account of which is given in McCrindle et al. (2011) and summarized in Appendix 3.

Table 3.1 Focus points in animal product supply chains for food safety regulations in South Africa

Supply chain area	Focus point or activity or function targeted by regulation
Production	animal improvement, animal production, disease control, animal movement, medicines and feed control, animal protection and welfare
Processing	slaughter, manufacturing, product handling and conveying
Consumption	product standards, quality control, food outlets, sales
Imports and exports	quarantine, trade regulations
Chain-wide	hazardous substances, environmental and waste management, residue control, zoonoses control, biodiversity management, human health, transport

Source: McCrindle et al. (2011)

The regulatory system may appear complex because a particular Act may address a specific focus point at a particular stage in the supply chain or several focus points at a given stage or across stages in a supply chain, and a particular point in a chain may come under the purview of several acts implemented by several authorities. Different Acts that govern food safety are regulated by a number of different government institutions. There is no single agency that has primary and over-arching responsibility for food safety across the supply chain. Government departments do not have conflicting missions, and their responsibilities are broadly as follows:

- Department of Health (DOH): human safety
- Department of Agriculture, Forestry and Fisheries (DAFF): animal health and production
- Department of Environmental Affairs and Tourism (DEAT): environmental impact

However, a number of para-statal organizations, industry bodies and research institutes also play a role, either as being tasked with complying to regulations, or as generating information that support food safety. Large commercial food industries also have their own standards and codes of practices that complement the government regulations and serve as a tool for product differentiation. Consumer watchdog organizations also play a role. Co-ordination depends upon cooperation between the various government departments involved, and some miscommunication exists. A distinction between formal and informal food supply chain is recognized and the products from informal chains sometimes enter the formal chains due to malpractice of agents, e.g. animals stolen from ranches may enter the formal meat chain without proper identification or animals from informal production systems without proper identification may occasionally enter the formal chain. In case of milk, adulteration is a common problem in the informal chain.

3.1.6 Tanzania

There are a number of legislations or acts to address food safety problems and there are a number of regal provisions in the relevant acts for the control of some specific types of foods such as dairy, meat, fish falling under the mandate of different ministries (Kurwijila et al., 2011 and

Appendix 4). While there is considerable trade in raw and processed foods between Tanzania main land and Zanzibar, it must be noted that food regulations and standards are not part of the issues covered under the Union matters between the Tanzania mainland and Zanzibar. Thus, Zanzibar has a few laws and regulations of its own regarding food safety and quality and consumer protection (Appendix 4).

Since 1996, under the local government reform programme, the federal government is responsible for regulation of food safety issues but power of law enforcement lies with the local authorities. However, this structure does not work well due to unequal distribution of manpower and resources. Moreover, several regulations have duplication of mandates for different agencies, which are not always adequately represented at the local government level. This situation is a sign of lack of adequate understanding among policy makers and legislators about the scope of food safety related activities and lack of seriousness to streamline the regulations by making appropriate revisions or amendments.

There is no institutionalized food-borne disease surveillance system though TFDA is currently conducting a pilot project on this in 17 districts of Dodoma, Singida and Manyara regions. There is no monitoring programme on chemical (including pesticide, veterinary drug residues and mycotoxins) or microbial contamination of local food supply. Therefore, there is no data on which to base risk assessment of food-borne hazards and justify subsequent risk mitigation strategies.

Tanzania has ratified the WTO SPS and TBT agreements that govern food safety and agricultural products in international trade. As such, the country recognizes the standard and guidelines established by FAO/WHO Codex Alimentarius Commission (CAC), the phytosanitary measures stipulated by the World Animal Health Organization (OIE). TBS standards – and regional standards issued within the East Africa Community – are based on the above international standards, recommendations, guidelines and codes of practice. However, there is little practical application of these standards as Tanzania has little international trade in animal products.

3.2 Laboratory and manpower capacity for implementation of food safety regulations

The overall size and structure of the administrative and laboratory capacities and number and skill level of staff for implementation of food safety regulations are quite different in the study countries because of differences in the size of the economies, especially the food, agriculture and health sectors. They also have different history of the development of food safety regulations and associated physical and manpower capacities. Comprehensive data on these could not be gathered though in Appendices 1-4, some qualitative information on staff engaged in food safety activities exclusively or in combination with other activities are shown. Quantitative measures of inspection and laboratory capacity and manpower for implementation of food safety regulations with respect to animal source foods are rather difficult to show because a laboratory or inspection authority may have multiple functions so how much of its capacity and manpower are allocated to deal with safety of animal source foods is difficult to measure directly. For example, a Public Health Department may have many functions implemented by a given administrative and laboratory facility and a number of staff of different skills, but how much of that is engaged

in the activities related to the safety of animal source foods could not be ascertained. However, the research team in each country collected qualitative and some quantitative information on physical and manpower capacities and on that basis developed a perceptive scale about the adequacy of various facilities and personnel to deal with safety of animal source foods. These are summarized in Table 3.2.

It appears that Kenya, Ghana a d South Africa have good laboratory and manpower capacity in most areas needed for testing food samples, disease diagnosis while Ethiopia and Mozambique have the least capacity. Tanzania is also lies at the lower capacity end. However, it should be noted that in some cases the number of physical laboratories infrastructures may be adequate but some key equipment and skilled personnel may be lacking to achieve good result.

Table 3.2 Adequacy of laboratory and human resources capacity for food safety management in the study countries

Capacity and manpower	Ethiopia	Ghana	Kenya	Mozambique	South Africa	Tanzania
Labs for food borne disease diagnosis	4	2	2	3	1	2
Labs for testing food samples for quality and safety	4	1	1	3	3	2
Skilled personnel for food borne disease diagnosis	3	1	1	2	**1**	3
Skilled personnel for testing food samples for quality and safety	**3**	1	1	2	2	3
Skilled personnel for inspection and surveillance	2	1	1	3	1	3
Skilled personnel for development of food standards	**2**	**1**	**1**	**2**	**1**	**1**
Skilled personnel for risk analysis	3	3	3	**3**	3	3

Key 1= Highly adequate 2= Adequate 3= Inadequate 4= highly inadequate 5=None

Source: Field survey among country teams

4. Food safety status and problems in the study countries

4.1 Criteria and procedures for assessing status and dimensions of the problems

Current status of food safety and problems related to assurance of safe food in a country is a function of the level of economic and agricultural development, nature of existing production systems and food value chains, policies, regulations and infrastructures developed to deal with health hazards and other food safety issues, and food safety measures of various kinds taken in the past. For example, South Africa being more advanced economically, is likely to have more comprehensive regulations and developed infrastructures compared to the other five countries, so the nature and relative importance of various health hazards and food safety problems there may be different than in the other countries.

Research on food safety in livestock products is scarce in the study countries but few studies that have been conducted in these and other developing countries indicate that food safety in the informal market is low due to significant rates of food adulteration, inadequate processing, high microbial loads, specially the presence of: brucellosis, tuberculosis, listeriosis, salmonellosis, *E. coli* O157:H7, cryptosporidiosis, cysticercosis, staphylococcois: antimicrobial residues and aflatoxins (Aboge et al., 2000; Arimi et al., 2005; Kang'ethe et al., 2005; Omore et al., 2004; Bonfoh et al., 2003; Mengistie, 2003; Mohammed et al., 1996; O'Ferrall-Berndt, 2003; Zewde, 2011). However, for the commercial livestock sector and for formal export chains, food safety situation is slightly better though scope for significant improvement remains. One of the limitations of the sample based research results is that these are often based on small samples from specific locations addressing a single problem or disease, so extrapolation for the whole country, especially determination of relative importance of the problems or diseases may be difficult. Therefore in the present study, available information from literature were combined with stakeholders' perceptions to produce a more comprehensive general picture about the status of public health and disease problems that affect food safety in the study countries.

In order to assess food safety situation in a country, five different criteria were considered. These are : status of general public health problems or hazards, status of food-borne diseases that are considered internationally important, status of food-borne diseases that are considered important in the developing world, probability of inspection of retail outlets that sell livestock products, and type of risk assessment and traceability scheme used in the food supply chains. The methods used for data generation for these criteria are discussed below.

First, some of the general public health problems may prevail at farm level, others in the feed chain, others at retail level, still others may prevail throughout the whole food chain. Based on literature review, 15 general public health problems likely to prevail at different levels in the food chains in the developing countries were identified. Then the research team in each country ranked these 15 problems according to their relative importance in the country for assurance of safe food, especially livestock products. The team also indicated the frequency or regularity with which these problems are tested by relevant authorities.

Second, some food-borne diseases are internationally recognized as important for public health and food safety. Based on literature review, 13 such diseases were identified and the research team in each country ranked the importance of each disease in that country on a three point scale – high, medium, low. A 'high' score for a disease would indicate that that disease was equally important in the country as in the international arena, on the other hand, 'medium' and 'low' scores would indicate that the importance of that disease in the country was lower than that in the international arena.

Third, some food-borne diseases are recognized as important in the developing countries. Based on literature review, 10 such diseases were identified and the research team in each country ranked the importance of each disease in that country on a three point scale – high, medium, low. A 'high' score for a disease would indicate that that disease was equally important in the country as in the developing world, on the other hand, 'medium' and 'low' scores would indicate that the importance of that disease in the country was lower than that in the developing world in general.

Fourth, a major source of food-borne disease infection is various food retail outlets and regular inspection of such outlets is one of the most direct visible ways of assuring supply of safe food for the citizens. Therefore, 13 possible retail outlets common in developing countries for selling livestock products alone or in combination with other foods/products were identified, then the research team in each country assessed the probability of inspection of each retail outlet as a measure to assure supply of safe food.

Fifth, as food supply chains become longer and more commercially oriented to respond to consumer demand, assurance of safe food requires assessment of risks at various points in the food supply chains and adopt appropriate corrective measures to address any identified problem. The logistics and infrastructure needed for this is more complicated than that required for simple inspection of retail food outlets. Therefore, the research team in each country enumerated which, if any, of the standard risk assessment methods and traceability systems are used in the livestock product supply chains to assure safe food. The risk assessment approaches considered were: informal risk assessment, qualitative codex alimentarius, quantitative codex alimentarius, qualitative OIE and quantitative OIE. Informal risk assessment may mean risk is assessed without using a documented framework, so the nature of its use may vary widely between agencies and countries. Traceability is defined as the ability to track the history, application, or location of an entity by means of recorded identifications' (US EPA, 1998). This trace-back system has many potential uses in food safety as it assigns responsibility of provision of safe food to primary producers, input manufacturers, processors and retailers. It allows easy recall of products that are found to be faulty.

For generating information on all the above criteria, the research teams in the study countries used slightly different approaches. Some research teams developed their own perceptions about the ranks based on their own professional knowledge, available statistics and literature review while others additionally consulted key informants or stakeholders.

4.2 Findings on food safety status and problems

4.2.1 Status of general public health problems

The findings on current status of general public health problems are summarized in Table 4.1. In interpreting the results, it should be noted that the study countries did not use the same ranking approach. While South Africa, Ethiopia and Tanzania used a scale of 1-15 to rank the 15 problems, Kenya, Ghana and Mozambique divided 15 problems into three groups ranking 1, 2 and 3 to indicate the relative importance of the 15 problems. Therefore, it is difficult to directly compare the importance of a particular problem across countries.

Table 4.1. Relative importance (rank) of selected public health problems and frequency of testing by appropriate authorities in the study countries

Location	Problem	Ethiopia	Ghana	Kenya	Mozambique	South Africa	Tanzania
Farm problem	Pathogenic bacteria of animal origin	1 E	P E		1 E	1 **R**	1 E
	Parasites	3 **R**		1 **R**	??	3 E	4 E
Feed chain and farm problem	Mycotoxins	5 E	2 E	1 **R**	1 **R**	5 **R**	8 E
	Hormones	11 N	N	2 yE	P N	6 N	Not present
	Pesticide residues	8 E	2 E	1 **R**	1 **R**	7 E	Not present
	Antibiotic residues	6 E	4 N	2 **R**	P N	8 E	3 E
	Heavy metals	9 N	N	1 **R**	1 **R**	9 E	Q
Whole chain problem	Pathogenic bacteria of human origin	4 **R**	P E	2 E	1 **R**	2 E	2 E
	Food-borne viruses	14 N	P E	1 E	P N	4 N	5 E
	GMO	12 N	M	2 E	P N	10 N	Not present
	Radioactive contaminants	15 N	9 R	2 E	P N	13 E	Q
	Chemicals	10 E	3 N	1 **R**	P N	13 E	Q
Retail problem	Food additives	7 E	2 E	1 **R**	1 **R**	11 E	7 N
	Adulteration	2 E	1 E	3 **R**	P E	12 **R**	6 **R**
	Deliberate poisoning	3 E	N	3 E	P E	13 E	Q

Note : Ranking within country. Rank followed by frequency of testing where R= Regular, E = Episodic, N = not tested, P = present but no ranking done, Q = Questionale

Source: Kang'ethe et al. (2011); Kurwijila et al. (201); Zewde (2011); Mohammed-Alfa and Tano-Debrah (2o11); McCrindle et al. (2011), Munguambe and Hendrickx (2011).

Subject to the above limitations, it appears that in South Africa and Ethiopia, problems that are more likely to prevail at farm and/or feed chains ranked high while those likely to prevail more at the retail level ranked very low. Some problems e.g. pathogenic bacteria of human origin and food-borne viruses that are likely to prevail throughout the food value chain ranked high while some others of the same type like GMO and radioactive contaminants ranked quite low. Regularity of testing does not seem to be related to the relative importance of the problem. For example only 1, 5 and 12 ranked problems in South Africa are regularly tested, while majority are tested episodically and some are not usually tested. In Ethiopia, only 4 and 5 ranked problems are tested regularly, all others are tested episodically or not at all. In Tanzania, relative importance of the problems show fairly similar pattern as in South Africa though it is reported that a number problems are not present or their existence is questionable. Whether nonexistence or questionable existence is the real situation or it indicates lack of adequate knowledge and information due to the absence of epidemiological research and survey is unclear. This latter possibility seems plausible as only adulteration, a medium ranked retail level problem, is regularly tested, all other ranked problems are tested episodically.

In Kenya, at every level in the food chain, there are high, medium and low rank problems. Of the 15 problems, 7 are ranked 1, 6 are ranked 2 and only 2 are ranked 3 indicating that public health problems are endemic throughout the food chain in spite of the fact that several of the problems irrespective of rank are regularly tested. Conversely, it can be said that testing is regular because the problems are endemic. In Mozambique, only 6 out of 15 problems were ranked, all as most important, and the other problems have been reported as present but not ranked. Of the 6 ranked problems, five are regularly tested and one is episodically tested. Whether lack of laboratory and manpower capacity is a reason for irregular or no testing of many problems in various countries was not clear.

4.2.2 Status of internationally recognized food-borne diseases

The results on local status of internationally recognized food-borne diseases are summarized in Table 4.2. Only South Africa ranked all the 13 diseases, the other countries ranked a few and reported others as not known or there was no evidence on their existence. Lack of surveys and epidemiological research might be the main reason for reporting lack of evidence or lack of knowledge. Of the 13 diseases, South Africa ranked only three – Listeria, Salmonella spp, and Toxoplasma – as high, implying that these diseases are as important in South Africa as elsewhere in the world. Of the remaining 10, 2 were ranked medium, 7 as low and one as not known, which means that vast majority of the listed 13 diseases are less important in South Africa than elsewhere in the world. Salmonella spp is the only disease that is equally highly important in all the study countries as elsewhere in the world but the importance of the other diseases is variable across countries though in most cases they are less important in the study countries than elsewhere in the world.

4.2.3 Status of food-borne diseases important in developing countries

The results on local status of food-borne diseases that are considered important in developing countries are summarized in Table 4.3. Out of the 10 diseases that are considered important in the developing world, in South Africa, 6 are equally highly important, 3 are less important than

elsewhere in the developing world and one is not found in food animals. In Ethiopia, 6 out of 10 diseases have been ranked, only 2 – Salmonella and Anthrax – are equally highly important as elsewhere in the developing world, other four are less important, and for 4 diseases, there is no evidence. In Kenya, 8 out of the 10 diseases have been ranked and none is as important as elsewhere in the developing world, and two are not known in the country. In Tanzania, only three diseases have been ranked and only one is as important as in the developing world, two are less important and other diseases are either not known or there are no evidence on them to make judgment about their relative importance. In Mozambique, only two diseases have been ranked and both are as important as in the developing world, and other diseases are either not known or there is no evidence on them to make judgment about their relative importance.

Table 4.2. Local status of food-borne diseases that are internationally recognized as most important

Problem	Ethiopia	Ghana	Kenya	Mozambique	South Africa	Tanzania
Campylobacter	Medium	nk	Medium	Low	Low	Medium
Clostridium perfringens	ne	nk	Low	Medium	Low	Medium
Cryptosporidium parvum	ne	Nk	Low	na	Low	Medium
Toxigenic Escherichia coli	Medium	nk	Medium	**High**	Low	Medium
Listeria	Low	nk	nk	Low	**High**	nk
Norwalk virus	ne	nk	nk	ne	nk	nk
Salmonella spp.	**High**	**High**	**High**	**High**	**High**	**High**
Staphylococcus aureus	Medium	nk	**High**	Medium	Medium	**High**
Toxoplasma gondii	Low	nk	nk	**High**	**High**	nk
Yersinia eterocolitica*	ne	nk	nk	ne	Low	nk
Botulism	ne	nk	nk	ne	Low	na
Enterococcus faecalis	ne	nk	nk	ne	Low	na
Rotavirus	ne	nk	Low	ne	Medium	na

Note : ne No evidence nk Not known na Not available

Source: Kang'ethe et al. (2011); Kurwijila et al. (201); Zewde (2011); Mohammed-Alfa and Tano-Debrah (2o11); McCrindle et al. (2011), Munguambe and Hendrickx (2011).

Table 4.3. Local status of food-borne diseases that are considered important in developing countries

Problem	Ethiopia	Ghana	Kenya	Mozambique	South Africa	Tanzania
Brucellosis (bovine and caprine)	Medium	Low	Medium	**High**	**High**	**High**
Tuberculosis (bovine)	Medium	Low	Low	**High**	**High**	Low
Trichinellosis	ne	nk	nk	ne	Not in food animals	nk
Cysticercosis (porcine)	ne	Low	Low	ne	**High**	Low
Salmonella	**High**	nr	Medium	nr	**High**	nr
E.coli	Medium	nr	Medium	nr	Medium	nr
Q fever	ne	nr	Low	nr	Low	nr
RVF	ne	nr	Low	nr	Medium	nr
Anthrax	**High**	nr	Low	nr	**High**	nr
Toxoplasma	Low	nr	nk	nr	**High**	nr

Note : ne No evidence nk Not known nr Not rated

Source: Kang'ethe et al. (2011); Kurwijila et al. (201); Zewde (2011); Mohammed-Alfa and Tano-Debrah (2o11); McCrindle et al. (2011), Munguambe and Hendrickx (2011).

4.2.4 Status of inspection of retail food outlets

The results on probability of inspection of various retail food outlets are summarized in Table 4.4. The probability of inspection is 100% for exported foods in all the countries, 100% for foods sold in supermarkets in all countries except Mozambique, 100% for foods served in hospitals and other institutions in Ethiopia and Ghana and 70% in South Africa, 100% for foods sold in formal restaurants in Kenya but 70% in South Africa and about 1% in the other countries. For all other retail outlets in all the countries, probability of inspection is very negligible or zero.

4.2.5 Status of risk assessment and traceability systems

In South Africa, all five risk assessment procedures are generally used by relevant organizations such as by the Department of Agriculture, Forestry and Fisheries for animal health and production, by the Department of Health for human safety and by the Department of Environmental Affairs and Tourism for environmental impact.

Mechanisms of supply chain traceability include identification regulation under the Animal Health Act (7 of 2000), and compulsory branding under the Livestock Identification Act (6 of 2002). Implementation of branding is operated by Livestock Associations, and extension services of the Department of Agriculture, Forestry and Fisheries and control is facilitated by the Stock Theft Unit of the South African Police Services. All livestock must be moved under a state veterinary permit to new owners, to slaughter facilities or to sales, but no record is kept of these permits.

Table 4.4 Probability of inspection of different retail outlets that sell livestock products alone or along with other foods/products

Retail outlets	Ethiopia	Ghana	Kenya	Mozambique	South Africa	Tanzania
Street foods	0	0.01	0.0001	0	0.1	0.001
Foods sold in rural villages	0.001	0	0.0001	0	0	0.01
Foods sold in pastoral areas	0	0	0.001	0	0	0.001
Foods sold in open markets	0	0.01	0.001	0	0.05	0.001
Foods hawked door to door	0	0.001	0.001	0	0	0.001
Foods at celebrations, feasts, events	0	0	0.01	0.01	0	0.001
Foods in remote areas	0	0	0.001	0	0	0.001
Animals killed for home consumption	0.001	0	0.01	0	0	0.001
Foods in institutions (hospitals, schools, canteens)	1	0.01	0.01	0.01	0.7	0.01
Foods sold in supermarkets	1	0.01	1	0.01	**?**	1
Foods sold in eating places: Formal restaurant	0.01	0.01	1.0	0.01	0.7	0.01
Road side / informal eating places	0.01	0	0.001	0	0.1	0
Foods exported	1	1	1	1	1	1

Source: Kang'ethe et al. (2011); Kurwijila et al. (201); Zewde (2011); Mohammed-Alfa and Tano-Debrah (2o11); McCrindle et al. (2011), Munguambe and Hendrickx (2011).

It is required by law that a stamp by a certified inspector must be displayed on meat for inspection, and all meat is displayed such that the stamp is visible. No premium is paid for meat displaying the inspection stamp. No additional quality or safety information is provided with meat, milk or eggs. Awareness of the safety logo or brand is mostly found amongst up-market

consumers. In supermarkets with private standards such as Woolworths, a price premium is sometimes paid for products with a safety logo or brand compared to identical products without.

If products of inferior quality enter the system, it mostly happens in the informal sector. Milk is adulterated with water or with other milk products at the market or at the point of distribution. Food inspectors inspect formal registered food outlets and retailers regularly (see above).

In order to comply with regulations, chilling and cooling facilities are present in most instances in the formal sector. This is not always the case in the informal sector. Some informal sectors are well organized and retailers pool resources to have access to shared chilling facilities. Meat traders in informal markets sell an entire carcass of beef/sheep/goat in one day. On the date of pension payouts, funds are available and carcasses can be sold within a few hours. In formal markets (such as supermarket chains) many carcasses are used per day.

In Kenya, informal risk assessment is used by relevant authorities. Traceback systems are operated by big private companies like Farmers Choice Ltd and Kenchic Ltd to satisfy their market requirements. For meat, each approved slaughterhouse/slab has an unique roller stamp that serves to identify the slaughterhouse/ slab and subsequently the source of the meat. The law requires that the inspecting officer stamps the carcass where the stamp can be easily seen. The presence of this stamp assures the customer that the meat has been inspected and found fit for human consumption (GOK, Cap 356, 1977). The stamp allows a traceback of the carcass to the originating slaughterhouse/slab. The slaughterhouses/slabs however, lacks a mechanism to link the carcass information with the movement permit data in order to trace the carcass to the origin of the live animal. This traceback system would require an electronic centralized data repository and archiving system that does not exist yet. Poultry carcasses are inspected but only one is stamped in a batch of every ten. Traceability in this case starts mainly from the processing factories.

In Ethiopia, Tanzania and Mozambique, only informal risk assessmen is occasionally used at some points and there is no traceability system in place. In Ghana, informal risk assessment and qualitative codex alimentarius is used very rarely at some points and none of the others are in use and there in no traceability system in place.

Thus, taking all five criteria into account, it appears that the problems of public health hazard and prevalence of important food-borne diseases are less intense in South Africa than in the other five countries, so the need for regular inspection of retail outlets is also much less in South Africa. Where problems are more intense, testing and inspection are supposed to be more regular but apparently that is not always the case in the study countries. The higher level of economic development, consumer demand for safe food and developed infrastructure to meet that demand may partly explain the better food safety status and less problems in South Africa. In other countries, plethora of regulations and acts with many provisions for assurance of food safety exist; however, few are actually implemented or practiced because they look ideal on paper but have little relevance for the variety of informal markets that dominate the study countries as elsewhere in the developing world.

5 Summary of key findings and implications

Smallholder production and informal marketing systems dominate the livestock sector in the developing countries. Livestock is a source of livelihood for a large segment of the population in these countries but they are constrained by prevalence of diseases and other health hazards to capture a significant share of the rapidly expanding market for livestock products. Safety of animal source foods has become a major concern both from domestic and international market perspectives and it is recognized that significant improvement in the safety standards will be required to improve smallholder livestock producers' access to high value market- both domestic and international.

In order to understand the current of safety standards and problems for animal source foods, a study was conducted in six sub-Saharan African countries - Ethiopia, Ghana, Kenya, Mozambique, South Africa and Tanzania. The objective was to review food safety policy and regulations and their implementation, food safety status in terms of a number of criteria e.g. nature of public health problems and regularity of testing such problems, prevalence of food-borne diseases of international and developing country importance, probability of inspection of various retail food outlets and the type of risk assessment and traceability systems being used in the animal source food supply chains.

Smallholder production systems and informal markets overwhelmingly dominate in the study countries and even in South Africa, which is economically most advanced among the study countries, informal systems cover nearly half of the livestock products market. In urban areas wet markets dominate and supermarkets share a small proportion of the market for animal products. Safety of animal products is an explicit policy objective in some countries while in others, food safety is implied in policy statements and public regulations are in place to address safety issues.

In nearly all the study countries, multiple institutions have mandates for food safety through various regulations or acts targeted to various stages and activities in the food supply chains. However, in some countries e.g. in South Africa and to some extent in Kenya, the scope of the acts are more clearly defined than in the other countries. Therefore, some acts can be applied to specific products and stages of supply chain to assure safety while in other cases scope of the acts are less focused or more fuzzy or generic so they are more difficult to apply to address specific problems. In most countries there is no single agency or authority for handling food safety issues and because of duplication of mandates and lack of coordination between agencies, regulations are often ineffective in diagnosing and controlling the problems.

Government policy regarding informal markets for livestock products is either naive or disabling in nearly all the countries because either no regulatory measures and infrastructure are in place to assure food safety, or where regulations exits, most national standards are derived from industrialized countries with large-scale production systems, cold chains, and functioning inspections systems: these proved anti-poor, inappropriate and unworkable in the developing country context.

Some of the common public health problems are highly present at various stages of the animal products supply chains though it appears that problems occurring at farm and feed supply chains rank higher than those occurring at other stages of the supply chains. Few of the public health problems are regularly tested for diagnosis, a few are episodically tested while some others are not tested at all. A large number of hazards, especially food-borne diseases that are considered internationally important and some considered as important in the developing countries are present, and for some hazards actual status is unknown. Most food in the traditional/informal sector is not inspected. Where some inspection occurs, it does not follow a 'farm to fork pathway' approach i.e. inspection happens only at some points and in a sporadic fashion. Only in South Africa, both quantitative and qualitative risk assessments are applied in varying degrees by regulatory authorities. In all other countries, formal risk assessment is rarely applied and where it is done, it is basically informal or qualitative in nature. In some countries, staff have been trained in food safety and risk assessment procedures but these are more often oriented to developed country situations and are not adapted to local needs or contexts. These are indications of lack of systematic, risk-based surveillance and inspection either because of lack of infrastructure and laboratory facilities and/or because of lack of skilled manpower. Yet another reason may be lack of a comprehensive approach and understanding of how to address these issues under conditions of poor consumer awareness and demand for remedies of such problems.

Given the above situation, some examples of specific actions that can be taken to improve food safety status in the study countries as well as in other developing countries are as follows:

- Formulate realistic regulations and food standards or reform existing regulations and standards to be more realistic and implementable to suit the systems of production and level of economic development rather than be idealistic based on imitation of the developed country standard which is unworkable.
- Use farm to fork approach but recognize the fact that most informal market chains are loosely connected sub-systems and not complete value chains, so engaging actors in the entire chains by regulatory bodies to produce common goods, i.e. safer food for all, will require participatory approaches and proper incentives in order to gradually improve the supply chains and their safety assurance procedures.
- Provide more intensive disease diagnosis and control services to primary production, which is the starting point for assurance of safe food
- Intensify disease/pest surveillance and product testing and strengthen accreditation/certification arrangements to discourage malpractices at all levels in the food chain
- Develop/apply more novel risk assessment and risk management systems e.g. participatory risk assessment
- Where large scale private commercial production, processing and marketing enterprises are emerging, with or without export links, encourage and provide incentives to develop their own standards, as complementary to public standards, to differentiate products in the competitive market either as a proactive measure to capture a new market or as a reactive measure to respond to the requirements of an existing market.
- Undertake technical/scientific research as well as regular epidemiological surveys as objective data based policy and strategy always give high pay-off

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Appendix 1. Laws and regulations on animal health and food safety in Kenya

Regulation or act	Implementing Agency	Target Commodity	Stage of Value chain	Mandate or purpose/mechanism	Overlaps
Cap 321 –Animal and crop Production Act	Departments of Animal Production and Veterinary Services	Live animal	Farm	Production management Animal breeding	
Cap 364 Animal diseases Act	Department of Veterinary Services	Live animal, animal products	Farm , Primary and secondary markets	Control of animal diseases	
Cap 345 Animal Feeds and Fertilizer Act	Department of Veterinary Services	Feed	Processing of feeds	Feed quality	
Cap 356, Meat control Act	Department of Veterinary Services	Meat	slaughterhouse	Transport of animals to S/house Inspection Transport of meat	Cap 242- Public Health Act
Cap 336 Dairy Industry Act	Kenya Dairy Board Department of Veterinary Services	Milk	Production and Sale Processing	Inspection ,marketing Import and export control	Cap 242- Public Health Act
Cap 363 Kenya meat Commission Act	Kenya meat Commission	Meat	Slaughterhouse, cooling facilities, Inspection	Control and licensing	Cap 356 Meat Control Act
Cap 254 Food Drug and chemical substance Act	Department of Veterinary Services Ministry of Public Health and Sanitation	Meat, Milk and Eggs	Primary and Secondary Markets	Inspection , quality and safety assurance	Cap 346 Pest Control Products Board Cap 242 Public Health Act
Cap 242 Public Health Act	Ministry of Public health and Sanitation	Meat, Milk and Eggs	Food Sale points	Premise inspection Food Inspection	Cap 356, Meat control Act Cap 254 Food Drug

					and chemical substance Act Cap 336 Dairy Industry Act
Cap 254 Food Drug and Chemical Substance Act	Ministry of Public health and Sanitation Department of Veterinary Services	Meat& Milk, Eggs	Sale point Storage Inspection at farm, market outlets	Food Inspection food confiscation and premises licensing Surveillance	Cap 242 Public Health Act Cap 356, Meat control Act
Cap 265 Local Government Act	Local Authorities	Meat and milk	Food Sale points	Premise inspection Food Inspection	Cap 242 and 254 Ministry of Public Health and Sanitation
Cap 378, Fish Industry Act	Ministry of Fisheries Department of Veterinary Services	Fish	Production, processing, Inspection Inspection of premises	Production, fishing vessels licensing, inspection at landing sites Inspection and certification of Export products	Cap 242 Public Health Act Cap 254 Food Drug and Chemical Substance Act

Source: Kang'ethe et al. (2011)

Appendix 2 Laws and regulations on animal health and food safety in Mozambique

Stakeholder	Ministry or supervising authority	Where in the food chain	Staff working on food safety	Mechanism/mandate
National Institute for Normalisation and Quality **(INNOQ)**	Ministry of Industry and Commerce **(MIC)**	Production; Processing; distribution	NA	- Development of standards (including food standards);
				- Provides calibration services to food testing laboratories; calibration of legal, Industrial, and meteorology equipment
				- Enquiry point for the TBT agreement of the WTO
Department of Inspection of MIC **(DI-MIC)**	Ministry of Industry and Commerce	Distribution / Commercialisation	NA	- Food business premises licensing
				- Food safety inspection of food business operators
				- Develops regulations on food business
				- Controls food at entry ports
Department of Environmental Health **(DSA)**	Ministry of Health **(MISAU)**	Production; Processing; distribution	NA	- Develops food regulations
				- National *Codex Alimentarius Commission* focal point;
				- Coordinates the food legislation enforcement
Environmental Hygiene and Medical Examination Centre **(CHAEM)**	Ministry of Health	Production; Processing; Distribution	NA	- Inspection of food business premises and food at entry ports;
				- Controls the occupational health
				- Food safety legislation enforcement
National Laboratory for the Hygiene of Food and Water **(LNHAA)**	Ministry of Health	Production; Processing; Distribution	25	- Food and Water testing (Chemistry and Microbiology)

National Institute for Fisheries Research **(INIP)**	Ministry of Fisheries **(MIP)**	Production; Processing; Distribution	NA	- Regulates on fishery activities
				- Enforces the fisheries legislation
				- Licences premises and vessels for fishery activities
7. Fisheries Inspection Laboratory **(LIP)**	Ministry of Fisheries **(MIP)**	Production; Processing; Distribution	26	- Analysis of Seafood (Chemistry and Microbiology)
				- Enforces the fisheries legislation
Central Veterinary Laboratory-Directorate of Animal Sciences **(DCA**)	Ministry of Agriculture – National Agricultural Research Institute **(MINAG-IIAM)**	Production; Processing; Distribution	166	- Conducts Research in Animal Diseases
				- Animal Disease Surveillance
				- Animal Vaccine Production
				- Chemical and Microbiological Analysis of feed and food of animal origin
Biotechnology Laboratory – (**IIAM)**	Ministry of Agriculture	Production	8	- Genetically improvement of plant food
				- Research on food plant improvement
Department of Agricultural Services	Ministry of Agriculture	Production; Processing; Distribution	NA	- Farm Diagnosis of Animal and Plant diseases
				- Animal and Plant Disease Surveillance
				- Animal Vaccination, Plague Control
				- Inspection of food from animal and plant origin
				- Livestock Licensing
Legal Department	Ministry of Agriculture	Production; Processing; distribution	NA	- Regulates on food from animal and plant origin
				- Regulates on land use rights
Plant Protection Department **(DSV)**	Ministry of Agriculture	Food Regulation, Food Inspections	NA	- Regulates on sanitary and phytosanitary measures;
				- Regulates the use/distribution of pesticides (licensing of pesticides importation and distribution);
				- Operates quarantine services;

				- Controls plague and insects;
				- National Enquiry Point for the WTO's SPS measures agreement
National Directorate for Veterinary Services **(DNSV)**	Ministry of Agriculture	Production; Processing; Distribution ,	4	- Regulates on livestock health
				- National Notification Authority to the OIE (same activities as of the Department of Agricultural Services, but at a National level

Source: Munguambe and Hendrickx (2011).

Appendix 3: Regulations on animal health and food safety, their scope and implementation authorities in South Africa

Stakeholder Name *Applicable to all commodities below	**Ministry or other authority**	**Where in the food chain**	**Staff working on food safety**	**Act and function/mechanisms**
NATIONAL & PROVINCIAL GOVERNMENT (Depts other than Agric and Health) Dept of Transport	Transport	Transport	No	Cross Border Road Transport Act, (4 of 1998) and Amendmend Act (12 of 2008) Carriage by Air Amendment Act, (15 of 2006) and Carriage of Goods by Sea Act (1 of 1986) • Transport across borders ; • Both Acts insist that cold chain is maintained during transport
Dept Inland revenue	Customs and Excise	Import/ export	Work with DAFF and DOH staff	Customs and Excise Act (91 of 1964) and Amendment Act (19 of 1994): • Regulates and inspects import-export
	DTI	Marketing	DAFF and DOH	Marketing of Agricultural Products Act (47 of 1996) • Regulates marketing
GOVERNMENT DEPARTMENTS				
Agriculture (National and Provincial)	DAFF	Animal Production and quality control	yes	• Formulation of agricultural policy and legislation • Co-ordination of agricultural services per province and local municipalities • Laboratory Services • Animal Health and disease control • Extension services • Import and Export • Border Control • Veterinary Public Health
Directorate Animal Production	DAFF	Animal Production	no	Animal Improvement Act (62 of 1998) Genetically Modified Organisms Act (15 of 1997) and Amendment Act (23 of 2006) • Regulating the registration of genetically modified organisms Fencing Act (31 of 1963), • Regulation of animal movement

Directorate Food Safety and Quality Assurance	DAFF	Food safety and quality control	yes	The Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act (36 of 1947) • Registration of agricultural and stock remedies (over the counter drugs); animal feeds; fertilizers and pesticides Agricultural Products Standards Act (119 of 1990) • Agricultural product food safety and quality assurance standards for meat, dairy and other products.
Directorate Animal Health, Veterinary Public Health and Quarantine Services	DAFF	Animal production, movement, quarantine, disease control, slaughter, quality control,		The Meat Safety Act (40 of 2000) • Make provision for the maintenance of proper standards of hygiene in the slaughtering of animals for the purpose of obtaining suitable meat for human and animal consumption, and in the handling, keeping and conveyance of such meat and animal products at and from abattoirs. The Animal Health Act (7 of 2000). • Controls animals & animal products, incl meat, milk, eggs, fish, honey and their products from an animal disease point of view. The mandate: to provide for control of animal diseases and parasites, for measures to promote animal health, and for matters related thereto, e.g. the control over imported animal products.
Directorate Agricultural Products Inspection Services	DAFF	Processor/ manufacturer to Consumer	yes	Animal Health Act (7 of 2000) Genetically Modified Organisms Act (15 of 1997) and Amendment Act (23 of 2006) Agricultural Products Standards Act (119 of 1990) Meat Safety Act (40 of 2000) South African Abattoir Corporation Act (17 of 2005) • Enforcement of Animal and Plant Health Regulations at points of entry/borders • Regulation of registered establishments WTO-SPS agreements
Department of Health (National, Provincial and Local)	DOH	Manufacturer or processor to consumer		Health Act (63 of 1977) and regulationsR918/1999 • Hygiene requirements for premises and transport); R1256/1986 (milking sheds and transport of milk) National Health Act (61 of 2003) Food, Drugs and Disinfectants Act (13 of 1929) Regulations relating to food and water vessels (Act 36 of 1919; R1575/1971)

				Foodstuffs, Cosmetics and Disinfectants Act (54 of 1972) • Monitors residues (various regulations pertaining to substance and toxin limits, application of HACCP, labeling of raw sausages and duties of inspectors and analysts) Medicines and Related Substances Act (101 of 1965) • Registers formulation of health policy and legislation; Regulations governing registration, administration and dispensing of Veterinary Medicines • Co-ordination of health services per province and local municipalities • Monitoring and registration of food outlets and processing plants including dairy International Health Regulations Act (28 of 1974) General regulations promulgated in terms of Public Health Act, 1919 • Transportation of Meat
Directorate Food Control	DOH	Manufacturer or processor to Consumer	no	The Foodstuffs, Cosmetics and Disinfectants Act (54 of 1972). • Governs the manufacture, sale and importation of foods. Set and enforce MRL's. Labelling regulations Import control exercised by provincial health authorities on behalf of national Dept.
Directorate Medicines Evaluations and Research	DOH	Farm to Fork registration and enforcement vet drugs	no	The Medicines and Related Substances Act (101 of 1965), amended by Act 59 of 2002. • Makes provision for the registration of veterinary drugs and foodstuffs/food supplements with medicinal effects or in respect of which medicinal claims are made.
Directorate Environmental Health	DOH	Farm to Fork	no	Hazardous Substances Amendment Act (53 of 1992)
Department of Trade and Industry (South African Bureau of Standards - SABS)	DTI	Farm to Fork for fish. For other meat: manufacturer to consumer	yes	Standards Act (29 of 1993). • Regulations address canned meat (more than 10% meat) & canned and specific standards for frozen processed food and marine products. Trade Metrology Act (77 of 1973) • Deals with labeling and measurements of goods for trade

Department of Environmental Affairs and Tourism (DEAT)	DEAT	Farm to Processor	yes	Environment Conservation Act (73 of1989) National Environmental Management Act (107 of 1998) National Environmental Management Waste Bill (B39/2007) Draft White Paper on Integrated Pollution and Waste Management for SA (August 1998)
PARASTATAL AND PUBLIC/PRIVATE PARTNERSHIP				
Stakeholder Name	**Ministry or other authority**	**Where in the food chain**	**Staff working on food safety**	**Act and function/mechanisms**
Milk SA (Dairy supply chain)	DAFF, DOH and DOT	Farm to Fork	yes	National Health Act (61 of 2003) • Regulations relating to milking sheds, the transport of milk and general hygiene Foodstuff, Cosmetics and Disinfectants Act (54 of 1972) • Control of hygiene, residues and food additives Animal Improvement Act (62 of 1998) • Genetically improved stock, e.g. artificial insemination Animal Health Act (7 of 2000) • Control of zoonotic diseases The Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, 1947 (Act 36 of 1947) • Control of farm feeds and stock remedies Agricultural Products Standards Act (119 of 1990) • Control quality of milk
SAMIC (Red Meat Supply Chain) Vs. Red Meat Abattoir Association (RMAA) CCMIT has been established in 2010	DAFF, DOH and DOT	Farm to Fork	yes	Meat Safety Act (Act 40 of 2000) • Abattoirs and meat hygiene Medicine and Related substances Act (101 of 1965) and The Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act (36 of 1947) • Veterinary drugs and farm feeds Foodstuff, Cosmetics and Disinfectants Act (54 of 1972) • Residues, premises and food hygiene Animal Improvement Act (62 of 1998) • Animal nutrition Animal Protection Act (71 of 1962)

				• Welfare Animal Identification Act (6 of 2002) • Branding and identification Animal Diseases Act (35 of 1984) and Environment Conservation Act (73 of 1989) • Soil pollution
Poultry Meat and Poultry Products Supply Chain	DAFF, DOH and DOT	Farm to Fork	yes	Meat Safety Act (40 of 2000) • Abattoirs and meat hygiene Medicine and Related substances Act (101 of 1965) and The Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act (36 of 1947) • Veterinary drugs and farm feeds Foodstuff, Cosmetics and Disinfectants Act (54 of 1972) • Residues, premises and food hygiene Animal Improvement Act (62 of 1998) • Animal nutrition Animal Protection Act (71 of 1962) • Welfare Animal Diseases Act (35 of 1984) Environment Conservation Act (73 of 1989) • Soil pollution
Fish Supply Chain	DEAT, DWA, DOH and DOT DAFF	Farm to Fork	yes	Environment Conservation Act (73 of 1989) National Environmental Management Act (107 of 1998) Foodstuff, Cosmetics and Disinfectants Act (54 of 1972); National Health Act (61 of 2003) and International Health Regulation Act (28 of 1974) Department of Transport Acts listed above SA Maritime Safety Act a95 of 1998) Maritime Zones Act (15 of1994) Carriage of goods by Sea Act (1 of 1986) Marine Living Resource Act (18 of 1998)
Game (incl. Crocodile, ostrich and other game)	DAFF, DOH, DEAT, DOT,			Meat Safety Act (40 of 2000) • Abattoirs and meat hygiene Medicine and Related substances Act (101 of 1965) and The Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act (36 of 1947)

				• Veterinary drugs and farm feeds Foodstuff, Cosmetics and Disinfectants Act (54 of 1972) • Residues, premises and food hygiene National Health Act (61 of 2003) International Health Regulation Act (28 of 1974) Animal Improvement Act (62 of 1998) • Animal nutrition Animal Protection Act (71 of 1962) • Welfare Animal Diseases Act (35 of 1984) Game Farming Policy Draft (874 of 2006) Environment Conservation Act (73 of 1989) • Soil pollution National Environmental Management Act (107 of 1998) National Environmental Management: Biodiversity Act (10 of 2004) Department of Transport Acts as above SARS Acts as above

Source: McCrindle and Meyer (2011)

Appendix 4. Tanzania and Zanzibar laws and regulations on animal health and food safety

Law or Regulation	**Institution involved**	**Sector regulated or mandate or purpose/mechanism**
Tanzania Laws		
Animal Disease Act, 2003	Ministry of Livestock Development and Fisheries	Meat hygiene; animal health ; veterinary drugs
Atomic Energy Act, 2003	Tanzania Atomic Energy Commission; National Radiation Commission	Food Irradiation; radioactive contaminants
Dairy Industry Act, 2004	Dairy Board of Tanzania under Ministry of Livestock development and fisheries	Dairy products
Environmental Management Act, 2004	Office of the Vice president, Division of Environment; NEMC	Water, waste water, solid waste, industrial effluents; Biosafety and GMOs; old pesticide stocks
Fish (Quality control and Standards) Regulations, 2000(L.N. No. 300 of 2000)	Ministry of Livestock Development and Fisheries	Fish and sea foods
Fisheries Act, 2003	Ministry of Livestock Development and Fisheries	Fish and sea foods
Fisheries Regulations, 2005	Ministry of Livestock Development and Fisheries	Fish and sea foods
Local Government (Urban) Authority Act; 1982; Local Authority (District) Authorities Act, 1982	TAMISEMI	All foods
Standard Act, 1975	Ministry of Industries and Trade; Tanzania Bureau of Standards (TBS)	National standards (including food product and processing standards)
Tanzania Food, Drugs and Cosmetics Act, 2003	Ministry of Health and Social Welfare; TFDA	All foods; food hygiene
Tanzania Food Drugs and Cosmetics (Food labeling) Regulations, 2006	Ministry of Health and Social Welfare (MoHSW); TFDA	Food labeling
Tanzania Food Drugs and	MoHSW; TFDA	Food Import and Export Control

Law or Regulation	Institution involved	Sector regulated or mandate or purpose/mechanism
Tanzania Laws		
Cosmetics (Food Import and Export)Regulations, 2006		
Tanzania Food Drugs and Cosmetics (Food Hygiene) Regulations, 2006	MoHSW; TFDA	Food Hygiene
Tanzania Food Drugs and Cosmetics (Transport of Meat) Regulations, 2006	MoHSW; TFDA	Transportation of meat
Tanzania Food Drugs and Cosmetics (Treatment and Disposal of Unfit Food) Regulations, 2006	MoHSW; TFDA	Treatment of unfit food
Food Hygiene Regulations of 2006	MoHSW; TFDA	
Food Additives Regulations 1998	MoHSW; TFDA	
Iodized Salt Regulations of 1994	MoHSW; TFDA	
?	TDB	Transportation of raw milk
?	TDB	Appointment of Dairy Inspectors
Zanzibar law and regulations		
Fair Trading and Consumer Act, 1992	Ministry of Trade; Fair Trade and Consumer Protection Bureau	All foods
Livestock Resource Management Act, 1999	Ministry of Health and Social Welfare	Meat hygiene, animal public health (includes meat inspection)
Plant Protection Act,1997	Ministry of Agriculture	Phytosanitary issues
Public Health Act, 1998	Ministry of Health and Social Welfare	Consolidation of public health regulations
Quarantine Rule	Ministry of Health and Social Welfare	Food import

Source: Kurwijila et al. (2011)