International Livestock Research Institute

Training course report

Food safety training

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Contents

Abbreviations and acronyms

AU	African Union
DALY	Disability Adjusted Life Year
EAC	East African Community
FAO	Food Agricultural Organization of the United Nations
GAHP	Good Animal Husbandry Practices
GAP	Good Agricultural Practices
GHP	Good Hygienic Practices
GMP	Good Manufacturing Practices
HACCP	Hazard Analysis Critical Control Point
ILRI	International Livestock Research Institute
LMIC	low- and middle-income countries
OIE	World Organisation for Animal Health
WHO	World Health Organization

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Executive summary

Food safety is crucial for human health and development. Unsafe foods are responsible for over 400,000 deaths yearly and loss of incomes. Low- and middle-income countries (LMIC) bear the brunt of the negative effects of unsafe foods. While the LMIC struggle to meet the strict safety requirements of the developed countries when trading in foods, their domestic markets are unregulated and are a threat to health and development.

Several reasons have been advanced for the poor state of food safety in LMIC. One is inadequate number of trained and skilled persons to take charge of the food safety situation in the countries. It is against this background that the International Livestock Research Institute (ILRI) and the CGIAR Research Program on Agriculture for Nutrition and Health mounted a training course on food safety. The workshop drew participants from within the East African Community (EAC) region and Ethiopia. They included representatives from academia and food safety regulation (health, veterinary, horticulture and standards) and the EAC desk on agriculture.

A total of 50 participants were trained in two batches in a period each lasting two weeks. The trainers were food safety experts drawn from the region and ILRI. Several topics were covered including risk analysis, traceability, food laws and policy formulation. Content was delivered through lectures, group work, and plenary discussions. Participants were also provided with copies of materials used in each session. The knowledge gained during the training was gauged during the second training course and this varied among the thematic areas and questions within each area (5–70%). The course achieved its objective of building capacity of local experts who would be food safety ambassadors in their respective countries. Those that completed the course were issued with certificates.

Background

The global burden of food borne diseases is large, 600 million cases and 420,000 deaths annually, affecting health, agricultural production and trade, thus limiting human economic development (WHO 2015). The 2015 World Health Organization (WHO) report on burden of foodborne diseases was an eye opener with regards to the importance of food safety. The burden is perceived to be high in the East African Community (EAC) partner states, actual data to enable calculation of the burden is however lacking. Food safety directly affects seven of the 17 United Nations Sustainable Development Goals. Unless food safety issues are addressed, the attainment of these seven development goals by the partner states could be partial.

One of the ILRI's critical success factors is to increase capacity among its stakeholders. In 2008, the Safe Food, Fair Food project, funded by the German Federal Ministry of Economic Cooperation and Development, embarked on capacity building of academia and regulators with a focus on the use of risk-based methodologies in addressing safety of animal source foods particularly those sold in informal markets. Capacity building workshops were held in Kenya, Uganda, Tanzania, Rwanda and Burundi.

The Safe Food, Fair Food project observed that food safety courses in all the EAC institutions of higher learning were not taught with a focus on food safety. There was therefore a need to develop capacity of academia and regulators on risk-based approaches applicable to food safety. The ideal approach would be to develop a food safety curriculum, but the approval process is lengthy and might take long to yield country-wide results. On the other hand, capacity building of stakeholders involved in food safety was and is a low hanging fruit which could lead to quick outcomes. The training course was organized in two cohorts. Cohort one included participants from Uganda, Rwanda and Burundi while cohort two had participants from Kenya, Tanzania, South Sudan and Ethiopia. Cohort one training was held between 8th and 19th July and cohort two between 13th and 23rd August 2019. The participants were drawn from academia (Public health, horticulture, and food science) and food safety regulatory agencies (public health, meat, milk and standards setting bodies). Content was delivered through lectures, group work, and plenary discussions. Participants were also provided with copies of materials used in each session. Trainers were food safety experts in the region and some of them had participated in the previous Safe Food, Fair Food project.

Objectives of the workshop

The objective was to train academia, researchers and regulators on food safety, and contribute to creating a critical mass of food safety experts in the EAC partner states who would campaign for, and spearhead food safety transformation in their countries. The greatest need is on safety of products sold in domestic markets particularly that involving animal and horticulture value chains whose products are perceived to contribute the biggest share of the foodborne disease burden. Training was structured to help participants assess the effectiveness of their National Food Control Systems using the Food and Agriculture Organization of the United Nations (FAO) toolkit for strengthening the national food control systems, and guidelines for assessment of capacity building needs (http://www.fao.org/3/a-a0601e.pdf).

Workshop proceedings

The workshop program for the two training workshops is provided as Annex 1. Details of what was covered in the individual sessions is not given. The emphasis is on the results of group plenary discussions.

Food safety (regional and global)

Session presentations were mainly introductory with emphasis being given to updating the participants on the global food safety situation as well as regional initiatives. Reference was made to the following: the WHO (2015) foodborne disease burden report; the World bank 2019 report on the food safety imperative (Jaffee et

al 2019); and the Lancet Commission report on Global Syndemic of Obesity, Undernutrition, and Climate Change (Swinburn et al 2019). Included was a summary of the recent food safety investment report by the Global Food Safety Partnership. Participants were also updated on the aflatoxin control work by the Partnership for Aflatoxin Control in Africa. The addition to the schedule was a presentation that outlined the journey that Vietnam took in the implementation of the country`s food safety control system.

The following is a summary of key points that came up from discussions ensuing from the presentations:

- The participants noted the neglected political will to address food safety in the EAC region, and suggested that ILRI (and partners) engagement with EAC Secretariat on Agriculture should also consider sensitizing the EAC summit on the importance of food safety in the region, including pushing for its pronouncement, considering the burden and cost associated with foodborne diseases, and the food safety link to both food security and attainment of the Sustainable Development Goals.

- On policies and legal instruments, the need to remove redundancies and devolve the functions to lower levels of government was observed.

- Propelling food safety agenda in the region requires collection of evidence that is context specific (on incidences of disease and the impact of food safety on trade). Food safety agencies in the EAC should form multi-agency regional task forces to address food safety issues. This would position the EAC to partner with the African Food Security Leadership Dialogue which has brought together major donors (African Development Bank, FAO, World Bank and International Fund for Agricultural Development) in a partnership that would provide resources to address food security in Africa to achieve greater impacts;

- In order to deal with the major food safety issues, the EAC partner states should prioritize food safety problems especially those in the domestic wet markets and use this to inform and direct donor funding and research. Such would lead to food safety transformation of these markets.

- The need to leverage market forces and make consumers partners in initiatives to improve food safety. This can be achieved through well planned food safety awareness programs and instilling food safety culture among the young population through training at all levels of education. Although governments have put up markets, traders are not using these for several reasons. A program to reform and transform these markets to make the actors compliant is needed.

- Private sector can drive food safety but there must be clear incentives. Lessons learnt from the Uganda Fish sector can inform participation. Fish companies came together and were willing to put up a lot of money to improve the sector.

- The need to establish or reinforce an integrated national monitoring / surveillance program which should link well at regional level. Participants were also told of a residue monitoring system for animal source foods that was being implemented in Uganda.

- Countries should have a plan for regular sampling, but absence of competent laboratories was said to be a hindrance. A study to map food safety labs in the region was proposed. Such would then be used as a basis to develop a framework that allows countries to use/ share the facilities (and addresses logistical issues).

Food infections and intoxications

The lecture included a session where participants were asked to:

- estimate the burden of food borne diseases in their countries;

- list the most important food borne diseases (3-6);
- list most important foodborne disease agents-bacteria, viruses, parasites and chemicals (3-6); and
- indicate systems that were (at the time) in place to detect and record foodborne diseases.

The outcome of this exercise is presented in Table 1. The results highlight several things:

- Foodborne disease agents across the seven countries are the similar
- and regional control programs can be planned
- lessons learnt from interventions in one country could be inform decisions in other countries

Further, participants were asked to reflect on foodborne disease in their own countries. They were specifically asked to:

- state which agency was responsible for investigating foodborne illnesses/outbreaks;
- conduct a quick search for any reports on foodborne illnesses/outbreaks (media, academic journals, government reports); and
- reflecting on foodborne disease outbreaks, explain how consumers are usually informed about these, and give their thoughts on the process.

In Ethiopia and Kenya, foodborne investigations are conducted by the Departments of Medical Health, Veterinary Services and Food and Drug authorities. Ethiopia has a One Health team while Kenya has established a Zoonotic Disease Unit, both of which are involved in outbreak investigations. In all the groups, there was concurrence that reports of disease outbreaks are in the electronic, and that print media, and recently also social media, is taking over the reporting and creating awareness among consumers. Social media was thought to exaggerate issues, the reason why food safety agencies should take the lead in informing the public on the foodborne disease outbreaks (than ceding this responsibility to the social media).

Table 1: Foodborne diseases (intoxications and infections) in the EAC states and Ethiopia

	Burundi	Kenya	Rwanda	South Sudan	Tanzania	Uganda	Ethiopia
Burden of foodborne disease	Data not available	Not calculated, report that 70% diarrhea is foodborne	672/1,000,000 population (Ssemanda et al. 2018)	No Data, weak institutions, infrastructure and uncoordinated systems.	Data from surveys exist but Burden not computed	5700/100,000 persons (WHO 2015) several other studies.	No available data, many reports
Important foodborne diseases	Salmonellosis, cholera, bacillary dysentery, listeriosis, campylobacteriosis, brucellosis, tuberculosis, aflatoxicosis	Cholera, typhoid, dysentry, brucellosis, anthrax, aflatoxicocis	listeriosis, salmonellosis, neuro-cysticercosis	Cholera, typhoid, tuberculosis, diarrheal dysentery, brucellosis, liver cancer	Cholera, typhoid, TB; brucellosis, aflatoxicosis, cysticercosis	Cholera, brucellosis, aflatoxicosis, tuberculosis, typhoid, cysticercosis, non-typhoidal salmonellosis	Salmonellosis, taeniasis, cholera, *E. coli*, listeriosis, campylobacteriosis
Foodborne disease agents - bacteria	*Salmonella typhi* and *S. paratyphi; Vibrio cholera*, Bacillary dysenteriae, *Listeria monocytogenes*, *Brucella abortus*,	*Vibrio cholerae*, Salmonella spp., *E.coli*, *Staphyloccocus* spp., Shigella *spp*, Brucella spp., *Bacillus anthraxis; Campylobacter* spp.	*Listeria monocytogenes, E. coli (STEC*), Salmonella spp.	S*almonella typhi, E. coli, Staphylococcus aureus, Campylobacter jejuni, Vibrio cholerae, Brucella* spp.	*Vibrio cholerae, Salmonella typhi*, *Brucella abortus*, *Campylobacter jejuni* and *E. coli*	Brucella *spp*, *Vibrio cholera*; Mycobacterium *Spp*	*S. typhi, S. paratyhi*, NTS, *Vibrio cholerae*, *E. coli*, *L. monocytogenes*
Viruses		Rota virus,Hepatitis A and E, Rift Valley fever		*Hepatitis A, Hepatitis E*			Hepatitis, Rotavirus
Parasites		*Entamoeba hystolitica*,*Taenia saginata*; Echinococus *spp*, *Ascaris* spp.,*Giardia* spp.,*Cryptosporidium* spp.	*Taenia solium*	Spirallae	*Taenia solium* and *T. saginata*	*Taenia solium*	*T. saginata* taeniasis, Giardia spp., *Toxoplasma gondii,* Entamoeba spp.
Chemicals	Aflatoxin B1	Pesticides residues,vet drugs residues,heavy metals, persitent organic pollutants e.g. organochlorines ,dioxins,calcium carbide, hydrogen peroxide and formalin	Aflatoxin, Antibiotic residues	Aflatoxin *(Aspergillus flavus),* antimicrobial residues, pesticides and fertilizers, heavy metals, cyanide (from cassava)	Aflatoxin	Aflatoxin; drug residues & pesticides	Drug residue, pesticides (Zeway/Batu)
Systems to detect and record	Online platform exists for daily entry of data	DVS, Public health, Kenya Plant Health Inspectorate Service, Kenya Dairy Board. Coordination is through the national food safety coordination committee	Management Information system	Diagnostic and Nutrition Laboratory, Ministry of Livestock and Fisheries, Agriculture and Food Security, South Sudan Bureau of Statistics, Food and drug control	Department of Health and Veterinary services	Laboratories; Health care information services	Meat inspection: especially on export market, surveillance system, FDA, MoA, Ethiopia Standards Agency (ESA) establishes mandatory food standards and enforce FDA

Risk assessment: Codex framework

The presentations focused on equipping participants with knowledge on risk assessment (i.e. the first component of risk analysis as described under the Codex framework). The emphasis was on the understanding of the hazard, probability and risk concepts. Also covered was the epidemiological disease causation triad (agent, host and environment), the Hazard Analysis Critical Control Point (HACCP) and Risk Analysis.

The participants were asked to qualitatively assess the probability and the consequence associated with the following dangers:

i) Car accident in the capital city of the participant country (no person injured)

ii) Technical failure in a nuclear plant

iii) Illness of hepatic cancer due to consumption of maize bread (or ugali) contaminated with aflatoxins

They were asked to provide their own risk perception of the dangers given in the example and state what information they needed in order to make their assessment more objective. Use terms such as "highly unlikely, unlikely, likely, highly likely" for probability and terms like "negligible, low, moderate, high, very high" for the consequence was explained. The output from Kenya in given in Table 2 and is a good representation of work from other countries.

Table 2: Sample qualitative probability and risk assessment

	Probability	**Consequence**
Car accident in your town (no injuries)	Highly likely	Moderate
Technical failure in a nuclear plant	Highly unlikely	Very high
Illness of hepatic cancer from consumption of maize bread (ugali) contaminated with aflatoxins	Likely	High

In the follow up example, participants were asked to use either qualitative or semi-quantitative risk assessment to:

- Estimate the risk of illness due to an agent of significance (from the hazard analysis exercise) in a defined food matrix in their country
- Use a qualitative/semi-quantitative approach as the case may befit
- Justify their risk assessment parameters

For Tanzania, the risk assessment question was "*what is the risk of intoxication with aflatoxin B1 from eating Ugali made from maize contaminated with aflatoxin?". Ugali* is a popular meal prepared from maize flour. Figure 1 is the scenario pathway showing the risk of intoxication as a result of eating ugali prepared with different kinds of flour (*sembe* or *dona*). Similar pathways were reported by groups representing other countries.

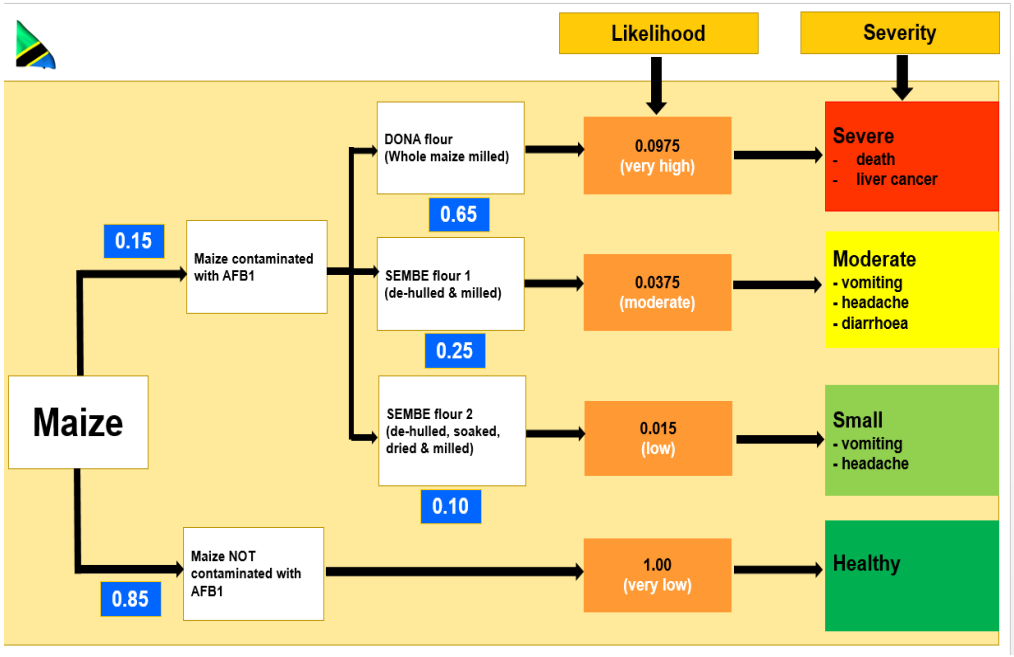


Figure 1: Scenario pathway of intoxication with aflatoxin B1 from eating "ugali" prepared from maize that is contaminated with aflatoxin B1

Risk assessment: OIE/WHO model

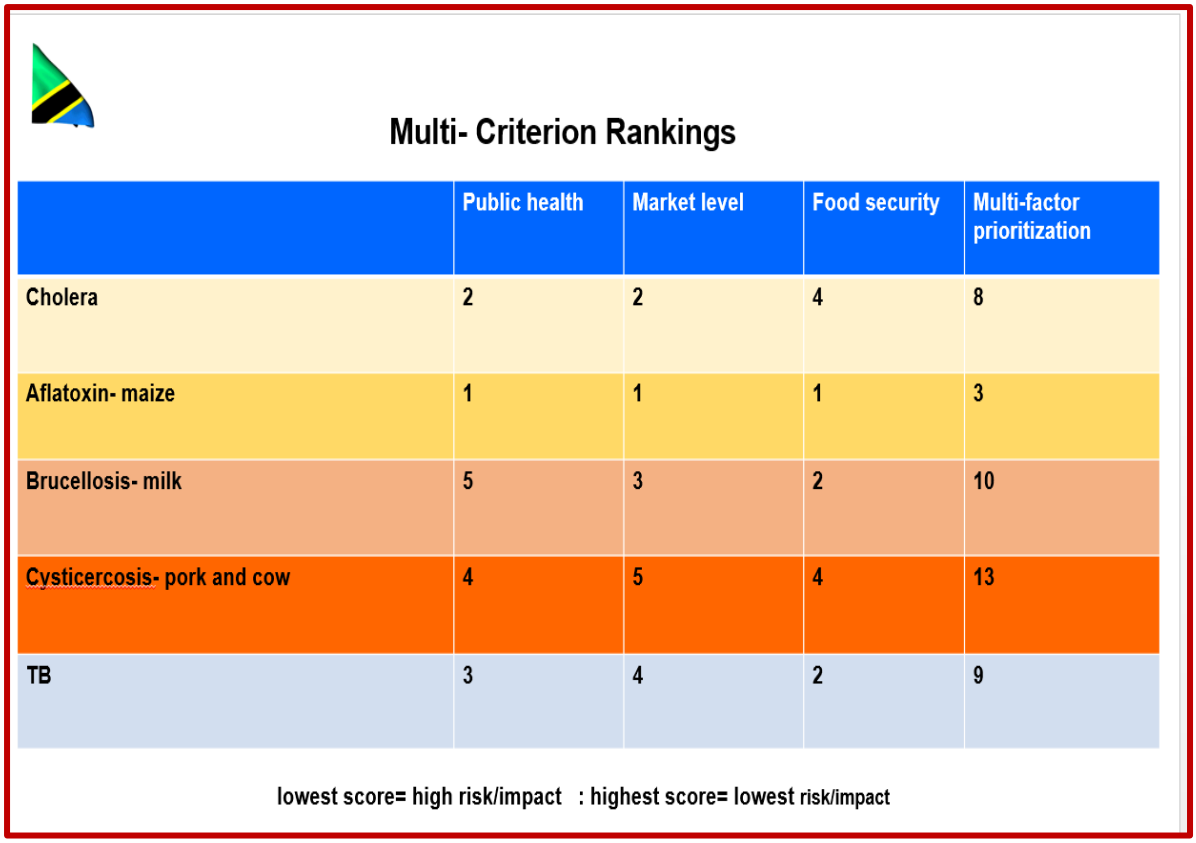
The participants were introduced to concept of probability (likelihood) and use of binomial distribution models. This type of models applies when determining the probability of success of an event which has only two possible outcomes (in a series of experiments). The aim was to make it easy to calculate the probability of including an infected animal in an import/ export consignment from areas with and without sanitary measures. The participants were introduced to calculation of binomial probabilities using the R-software, particularly the use of d-nomial, p-nomial, q-nomial and r-nomial functions.

Risk communication

The importance of communicating the risk assessment outcomes to the risk managers was emphasized. The participants were asked to select foodborne cases and give examples of what they considered as good and bad risk communication processes, from the risk managers (the lead agencies). Table 3 shows the sample outcomes of the exercise.

Risk management

In this session, participants were taken through the risk management decision making process, using multiple factors. The country teams used their list of the top five diseases (Table 1) and prioritized these using the multi-factor criteria. The criterion uses public health (immediate illness, long term effects and death), market level (impact on domestic and export trade), and food security (access and nutritional) factors. First, assessment matrices were constructed and those with the lowest (lowest impact) and highest (highest impact) scores used. However, in cases where the three factors were combined, the lowest score had the highest risk/impact (while the highest had the lowest risk /impact). Figure 2 is the risk prioritization output as reported by the Tanzanian team.



Multi- Criterion Rankings

	Public health	Market level	Food security	Multi-factor prioritization
Cholera	2	2	4	8
Aflatoxin- maize	1	1	1	3
Brucellosis- milk	5	3	2	10
Cysticercosis- pork and cow	4	5	4	13
TB	3	4	2	9

lowest score= high risk/impact : highest score= lowest risk/impact

Figure 2: Multi-criteria ranking of foodborne diseases (as given by food safety team representing Tanzania).

Risk analysis: Case study

A case study of the risk of cryptosporidiosis in urban livestock farming in Dagoretti was discussed, right from the formation of the multidisciplinary research team, risk assessment, risk communication and management steps. The participants (cohort 2) were asked to plan a risk analysis project of a pathogen they had considered a priority) (using a food matrix of their choice). Participants from Kenya worked on the risk of contracting cholera from eating vegetables grown using sewage water. Those from Ethiopia looked at the risk of contamination of meat with non-typhoidal Salmonella from slaughtering process. The exercise was designed to make the participants apply the concepts learnt and appreciate the cost of carrying out a proper risk analysis. This was in anticipation of the lecture on the use of participatory methodologies in risk assessment.

Table 3: Risk communication: Analysis of cases of good and bad communication process in food borne diseases outbreaks

CASE	Type	Background	Action	Communication
Cholera outbreak from eating food served in wedding party	Good	Four hundred fifty guests in a wedding party eat food and later one die from cholera. Several people in hospital	Lead agency has set up a task force to lead the process, case management and public relations team Targeted audience: Government officials, healthcare providers (hospitals), media, special groups (schools, food handlers, etc.,), sectoral partners and public	Through print media, developed IEC materials, etc.; electronic and social media; *How many people are sick? What contaminated food is linked to the outbreak; signs and symptoms of the illness and advice to consumers and retailers about foods to avoid eating or selling*
Red meat alert contaminated with sodium metabisulphite	Good	High end butcheries found to sell meat with high levels of sodium metabisulphite through a media exposé.	After the airing of the exposé leady agency came out with a press release, ordered samples to be taken and analyzed.	Out of 180 samples only two failed the test, the communication was timely, transparent, well-coordinated and executed by the lead agency.
Red meat alert with high levels of sodium metabisulphite	Bad	After an investigative journalism, media exposed the risk posed by butchers who sold this meat to unsuspecting customers	Consumers panicked, meat consumption declined, meat outlets closed. Lead agency did not take charge, running behind media reports	Issues were reported through media, lead agency losing trust of the population. Its reactive than proactive.

Visit to markets

The purpose of the visit was to 1) acquaint some of the participants who are not conversant with the activities and food safety issues that plague these type of markets (informal-domestic) and 2) to get the participants start to think on what it would take to transform these markets to institutions which consider food safety.

Atiklit-Tera vegetable market

This market, located in the central part of Addis Ababa, receives vegetables and fruits from all parts of Ethiopia. It's the main wholesale market. The vegetables sold here include tomatoes, onions, pawpaw, coriander, potatoes, cabbages etc. Apart from the wholesalers, the market has attracted other people who offer other services like cooking and hawking tea, chapatis, boiled maize and selling small quantities of the vegetables and fruits sold by wholesale shops. The market was crowded with little space to maneuver as couriers ferried on their backs produce sold by the wholesale shops to the customers. The place was muddy and sanitation very poor. There seemed to be no supply of water for cleaning of the produce. The space for selling the produce was not adequate for the operating hawkers. Some of the vegetables were placed on muddy floors.

Suggestions on how the market could be transformed

- The local authority must buy-in the need for transforming the market considering the food safety concerns raised above.
- The local authority will need to provide an alternative site which is large enough to accommodate the various activities taking place in this market. The current one can also be made solely into a wholesale market and all hawking be shifted elsewhere.
- The people operating from this market will need to buy-in the need for this transformation and agree to form organizations based on commodity they sold.
- The design for the new market will need to be agreed upon by all stakeholder representatives and should meet both the food safety requirements and the needs of those operating from the market.
- The local authority should consider incentives that will attract stakeholders to move to the new site.
- Build capacity on best practices (hygiene) that food handlers (hawkers) should adhere to in order to deliver safe produce to consumers. A training-of- trainers' approach would ensure sustainability (where food safety champions lead new entrants and refresh the established ones). The training initiative should be a partnership between the trainers, local authority and the traders' organizations.
- The process should leverage the market driven forces (e.g. food safety awareness campaigns) and make sure consumers demand food that has been properly handled. This exercise should be an ongoing activity to develop and instill a food safety culture in the population.

Kera meat market

The meat shops were in the same locations. Meat was hung and consumers would visit and request what they wanted. No running water was observed in the meat butcheries. Several heads and offal were found placed on the dirty pavements. The butcheries had electricity, but refrigeration facilities were found lacking. Meat attendants did not have protective clothing and were found to handle money and meat at the same time.

Suggestions on how the market could be transformed

- Provide running water to ensure observance of good hygienic practices

- Train butchery attendants on the importance of adopting hygienic practices
- Because meat is easily contaminated and considering practices of consumption foods like *kitfo* and raw meat, hygiene is not only very important but imperative and the attendants need not to be only trained but certified too.
- The local authority should consider building a new market where facilities like refrigeration could be provided for hire to butchery owners for preserving unsold meat. This would promote improvement in hygiene and prevent losses.

Disability Adjusted Life Years and conceptual frameworks

The concept of Disability Adjusted Life Years (DALY), how it is calculated and its significance in computing the burden of foodborne diseases, was reviewed. The use of conceptual models (event and fault trees) was explained. Event trees have an initiating event which is mapped to determine its consequence. They assist in preventing adverse outcomes from occurring. Fault trees are for mitigating the risk of outcomes that have already occurred. An outcome event is identified and traced backwards to define the causes and mitigate them. Symbols are used to connect the events leading to the outcome.

Good agricultural, hygienic, animal husbandry practices and god manufacturing practices

These are simple practices along the food value chain, and when done correctly and consistently, can give a greater assurance of food safety. Good Agricultural Practices (GAP) addresses environmental, economic and social sustainability of on-farm processes with the result being provision of safe and quality food. Good Hygienic Practices (GHP) are all conditions necessary to ensure safety of food at all stages in the food chain. It coves primary production, design of facilities, control of operations, maintenance and sanitation, personal hygiene, transportation, product information, consumer awareness and training. Good Animal Husbandry Practices (GAHP) are practices that ensure animal production systems are appropriate to the species and land available to reduce stress, microbial and parasitic build up in the animal environment. This reduces the chances of infections and become a risk to consumers of animal products from such animals. Good Manufacturing Practices (GMP) are a combination of manufacturing and quality control process and is aimed at ensuring products are consistently manufactured to their specifications.

Hazard Analysis Critical Control Point

The participants were taken through the history, the purpose, the principles and the HACCP implementation plan. After being exposed to the theory, they were given an exercise to develop an HACCP plan of different food products: pasteurized milk, sundried fish, vegetables and poultry for cohort 1 and yoghurt, smoked fish, vegetable salad and sausage for cohort 2. The team for Tanzania worked on sausage preparation and Figure 3 is a summary of their hazard analysis plan.

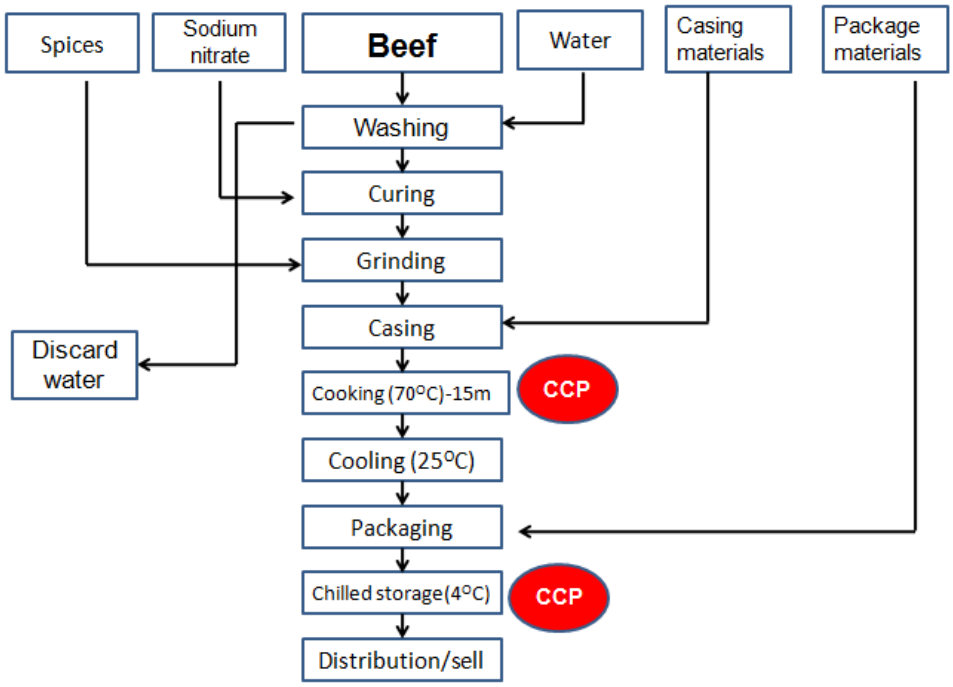


Figure 3: Sample HACCP plan for beef sausage production.

In plenary, the plan was reviewed to identify errors in the proposed design. Firstly, there was no indication of any hazard identification at the level of the incoming raw materials, the flow diagram had steps that were not flowing well (grinding lean meat, grinding of fat, addition of binders and spices, addition of cure ingredients, further mixing) and at each critical control point, there was no indication of the hazard type being removed. These errors provided a positive critique to the entire process.

Food traceability systems

The team was taken through the importance of traceability, external and internal (withdrawal) traceability, and recall systems. A round table discussion was held on available tools, and challenges of implementing traceability in the developing countries. Traceability tools observed included the use of animal identification devices (ear tags, boluses, microchips) and product barcodes.

The challenges listed were:

- lack of a registration system for farmers and livestock
- recording keeping culture by producers is pitiable
- too many suppliers especially in the informal / domestic markets making traceability difficult
- Majority of the countries have no traceability and recall systems policies and or regulations therefore, enforcement is difficult.
- establishing a traceability system is very costly and cash stricken developing countries may not prioritize this in near future;
- developing countries lack skills and capacities to assure implementation and sustainability
- there is a lack of clear communication of the government's intention to stakeholders on implementation of programs and
- the need to encourage innovators to design traceability systems appropriate to the complex food value chains in the informal and other domestic markets.

On disease reporting, participants were asked to review reports of foodborne diseases in their countries. Each country has a reporting system in place. For example, South Sudan has an integrated disease surveillance and response system. Kenya has an integrated disease surveillance and response system and a health information system. Ethiopia and South Sudan confirmed having similar platforms sponsored by WHO, as a requirement for disease reporting by countries. Majority of cases reported by media and Ministry of Health in South Sudan were cholera outbreaks in internally displaced persons camps. The outbreaks were largely due to lack of portable water in the camps. A total of 473 cases and 9 deaths were reported. In Kenya, the reports indicated that between January and November 2017, there were 6 cases of anthrax (with 1 dead); 10 cases of Rift Valley fever (6 dead) and 3967 cases of cholera (with 76 dead). In Tanzania, 542 cases of cholera and 44 cases of aflatoxin were reported but tracing the incriminated produce was reportedly difficult.

Recall systems

This system is important in removing hazardous products from the market. The reasons for recall were observed. Whenever there is a problem, producers are expected to inform regulators who would initiate the product recall process.

The traceability and recall system are interlinked and are important elements of food safety. They both require robust record keeping and quality management systems which are often lacking in informal markets. Workshop participants were asked to reflect on traceability in informal markets and indicate which tools and systems are available to establish these. Figure 4 is a summary of what the groups on how a mobile traceability system for the domestic market could look like.

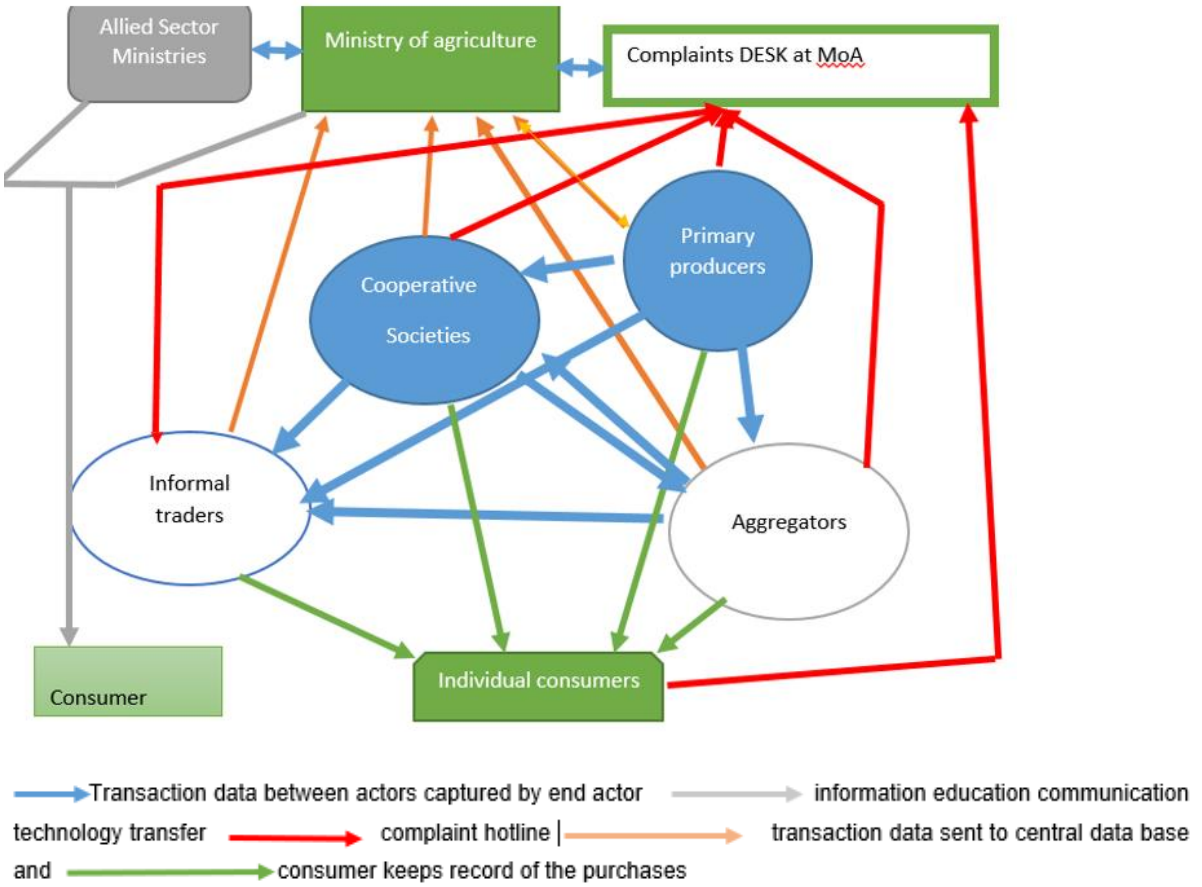


Figure 4: Conceptual model for a traceability system in domestic markets.

Box 1: Requirements of a mobile traceability and recall systems

There was consensus that a traceability system should use a mobile- based platform to capture data from primary producers (who should be specialized on utmost two commodities and will be given a unique identifier), cooperative societies (who are registered and are given unique identifiers), aggregators (who are expected to aggregate utmost two commodities) and are also uniquely identifiers and the informal traders (also required to be registered and should not be required to trade in more than two commodities). Such would improve on hygienic practices and the specialization which is currently lacking.

Data that will be captured from each category include:

- Primary producers – identifier, location, commodity, farming system, livestock numbers and their identities
- Cooperatives – Location, commodities they will be dealing in, amount received from producers and their identity
- Aggregators –identity, location, commodities they will be transacting with, identity of product source and volumes
- Informal traders – location, commodities, sources (identity) and volumes.

Once any transaction is done, the actors involved should enter this in their portal (the actor selling and actor buying), and this should indicate the volumes transacted.

Consumers would be required to keep the transaction receipts of their purchases to allow for one step back tracing.

The platform will have a hotline number (or reporting system) for lodging complaints which will acted upon by the complaint`s secretariat and feedback given. If a recall is ordered, the recall system will swing to operation. A generic FAO/WHO recall plan can be downloaded at http://www.fao.org/3/i3006e/i3006e.pdf and be domesticated as required.

National food safety control systems

The importance of the national food safety control system, its elements (policy, legislations and regulations, food control management, food inspections and food laboratories) and responsible agencies was explained.

The participants were asked to consider their existing governance system, legislations, control management, inspections, laboratories and information, education communication and training and use that to assess their countries' National food control systems. A summary of the responses is given in Table 4.

Table 4: Scope of the national food safety control systems

Country	Governance	Legislations	Food control management	Inspections	Laboratories	Information, education, communication and training
Burundi		Decree-law n°1/17 of May 7th, 1992: Creation of Burundi Bureau of Standards and quality control; Decree n°100/68 of March 18th, 2015: Regulation on food fortification; Law n°1/03 of January 4th, 2001: Law on National system of standards, metrology, quality assurance and trials; Agreement on sanitary and phytosanitary measure in EAC; Law no 1/103 of May 27th, 2017: Agreement technical barriers to trade in EAC; Law on seed certification; Law on pesticide residues.	BBN: National Bureau of Standards. The Bureau comprises four technical divisions: Standardization and Metrology Division; Laboratory and Inspection Body Certification, Accreditation and Supervision Division; Training and Technical Help to Companies Division and Standards Documentation Division. Cabinet/Presidency; Health; Food and agriculture; Finance, budget and planning; Development; Trade; Environment; Industry		Standardization and Metrology Division; Laboratory and Inspection Body Certification, Accreditation and Supervision Division; Training and Technical Help to Companies Division; Standards Documentation Division	
Kenya	Ministry of Health	Food Drugs and Chemical Substances Act Cap 254; Public Health Act Cap 242; Meat Control Act Cap 356; Animal Disease Act 364; Crops Act Cap 2012; Dairy Industry Act Cap 336; Standards Act Cap 496; Radiation Protection Act Cap 243; Kenya Plant Health Inspectorate Service Act 2012; Fisheries Act 2016; Biosafety Act 2009	It is multi-agency Every agency (22) have their own mandate as per the legislation	Directorate of Veterinary Services – Foods of Animal Origin; Department of Public Health – all foods; Kenya Plant Health Inspectorate Service – foods of plant origin; Kenya Dairy Board – milk and dairy products, Kenya Fisheries service – Fish as food Radiation Protection Board- irradiated foods; National Biosafety Authority – GMO foods	National Public Health Laboratory; Government Chemist; Kenya Bureau of Standards ; DVS food safety laboratories; Kenya Plant Health Inspectorate Service lab; Universities lab; Kenya Agricultural and Livestock Research Organization labs	No specific entity is charged with this responsibility
Rwanda		Currently food policy and food safety law draft available and under review by the Prime Ministry Office Existing food standards by Rwanda Standards Board: food related standards including product standards, laboratory testing standards and system standards Other indirect laws and regulations: Law governing agrochemicals 25/2013 Ministerial order: Animal transport welfare; Ministerial order regulating the collection, transportation and	Multi-agency, Rwanda Standards Board (Standards, Certification, Testing laboratories), Rwanda Food and Drug Authority (Regulations, Compliance), Rwanda Inspection and Competition Authority upcoming (unprocessed foods, agro-chemicals, regulations of import	Rwanda Agriculture and Livestock Inspection and certification Services Import inspection Market surveillance Rwanda Food and Drugs Authority Market surveillance services Industry Inspection Services Import Inspection Services	Laboratories within RSB Chemistry Lab accredited, Microbiology Lab accredited, Metrology Labs (same of them accredited, Forensic Lab	Multi Agency MoH MINAGRI MINEDUC MINICOM

		selling of milk; Ministerial order regulating anima slaughtering and meat inspection; Ministerial order on transport and trade of meat **Policies and strategic plans:** National Dairy Policy and Strategy (NDS, 2012); Strategy and investment plan to strengthen meat industry in Rwanda (2012); Strategy and investment plan to strengthen the poultry industry in Rwanda (2012); Strategy and investment plan for small animal industry in Rwanda (2012); Master plan for fisheries and fish farming in Rwanda (2011); National beekeeping strategic plan (2006); Strategic plan for animal nutrition improvement program for Rwanda (2009); Law N° 32/2002 of 06 November 2002, on animal identification, Official Gazette dated 06 Nov	and export of plant and animal related products), Food safety Steering Committee under PM Office (made of these.)		Designated, Laboratories at the University of Rwanda Institute of Applied Sciences, Industry level Sampling and testing procedures: International Standards	
South Sudan	SSNBS, DFCA, Ministries of (Health, Livestock and Fisheries, Agriculture and Food Security), Local Government, Office of President	Scattered in various agencies (SSNBS Acts 2012, DFCA Act 2012, Consumer Protection Act 2011)	Multi Agency System – (poor coordination among the agencies)	Fragmented Food inspections (SSNBS, DFCA, Livestock and Fisheries, Agriculture and Food Security, Local Government)	SSNBS, DFCA, Ministries of Health, Livestock and Fisheries	No Single Point - inadequate
Tanzania	Ministry of Health; Ministry of Livestock and Fisheries; Ministry of Agriculture; Ministry of Trade	**POLICIES** National Health Policy 2006; Food and Nutritional Policy for Tanzania, 1992; National Livestock policy, 2006; Agriculture policy, 2013 **LEGISLATIONS** Tanzania Dairy Industry Act, 2004; Standard Act, No. 2 of 2009; Tanzania Food Drug and Cosmetics Act, 2003; Animal Disease Act, 2003; Meat Industry Act, No. 10 of 2006;	Multi-agency. Tanzania Bureau of Standards (TBS); Tanzania Meat Board (TMB); Tanzania Dairy Board (TDB); Chief Government Chemist Laboratory Agency (CGCLA); Tanzania Food and Drug Authority (TFDA): dissolved	Tanzania Bureau of Standards, Tanzania Food and Drug Authority, Chief Government Chemist, Tanzania Dairy Board – milk, Directorate of Veterinary services – animals and animal products, Tanzania Meat Board – Meat.	Chief Chemist Lab, TBS lab, Research Institutions labs e.g. SUA, National Fish Quality Control Lab, Water Quality Lab.	No single agency is charged with this responsibility.
Uganda		Uganda Constitution, 1995, Section 12 focuses on food security and nutrition; Food and Drug Act, 1959 amended 1964; Public Health Act, 1935; Dairy Industry Act, 2000; Animal Diseases Act, 1918; Local Government Act, 1997 amended 2015; Plant Protection and Health Act, 2015; Agricultural Chemical Control Act, 2006; Water Act, 1997; Uganda National Bureau of Standards Act, 1983 amended 2013; National Drug Policy and Authority Act, 2000; Prevention of Animal Cruelty Act, 1957; Fish Act, 1950; Adulteration of Produce Act, 1901; Seed and Plant Act, 2006; Meat Inspection Rules; Dairy regulations for marketing, processing of milk and milk products, 2003	Uganda has a fragmented food safety system. Different institutions carry out individual functions independently with minimal linkages. Multiple Agency System. The following institutions are involved: Ministry of Local Government, Ministry of Agriculture Animal Industry and Fisheries, Ministry of Trade, Industry and Cooperatives, Ministry of Health, Ministry of Finance,		UNBS Food safety Laboratory- Accredited; Government Analytical Laboratory-Accredited; NDA Laboratory; Chemiphar – Accredited; DDA laboratory; UCDA laboratory; National Animal Disease Diagnostic and Epidemiology Centre; Makerere University; Namalere Analytical	Uganda National Bureau of Standards; National Drug Authority; Dairy Development Authority; Coffee Development Authority; Uganda Revenue

		amended 2006; Plant Protection and Health Regulations, 2015 **POLICIES** Uganda Food and Nutrition Policy, 2003; Agricultural Policy; Meat Policy	Ministry of Internal Affairs, Ministry of Water, Lands and Environment		Laboratory; Ministry of Health Laboratory	Authority; National Environment Management Authority; Local Government and Urban Authorities
Ethiopia	Ethiopia follows a shared responsibility approach to monitor and enforce food safety laws and regulations. Ethiopian Standards Agency (ESA) Ministry of Health/Food and Drug Administration (FDA) Ministry of Agriculture (MoA) Ministry of Trade and Industry (MoTI)	Public health proclamation no. 200/2000 Production, distribution and sale of food and food products notice no. 145/1950 Meat inspection proclamation amended no.81/1976 Animal disease proclamation no 267/2002 Food registration directive no.41/2019	Shared responsibility, but weak integration FDA, MoA, MoTI (Ethiopian conformity authority, ESA)	FDA, MoA (including regional agricultural bureaus), MoTI (conformity assessment)	MoH (FDA, EPHI) MoA (VDFACA, NAHDIC) Bless agri food lab	MoH (FDA, EPHI) MoA ESA EMDIDI (Ethiopian meat and dairy industry development Institute)

Policy formulation

The definition, objectives, elements of a policy, the process of policy formulation, implementation were covered. The participants were requested to develop a policy paper to address the complaints from formal businesses that informal traders are having undue advantage and offer unfair competition as they do not pay the taxes. Box 2 is the summary from the discussion by Rwanda team.

Box 2: Policy paper on national policy on milk supply, quality and pricing in Rwanda

Background

Farmers are unhappy of the prices offered by the associations which explains the trend to sell milk through informal market. Associations are unhappy of informal traders as they pay higher prices to farmers comparatively to them. Consumer's complaints especially the high prices of the processed products through the formal market, but also food safety issues associated to the informal market products.

Performance of trends analysis

With regards to the current situation where the value chain is dominated by the informal market due to low price given to the farmers by farmer associations. The processor claims to get the raw milk at high price, and this explains the high cost of the product. The resulting consequences might be the lack of raw material at processor level leading to industry closure and increased food safety risks. The economic loss at the country level is due to reduction of revenues, increase of unemployment and the cost of health services.

SWOT analysis

- Strength-- existence of organization and regulatory framework in the milk value chain
- Weaknesses -- the lack of enforcement of existing regulations
- Opportunities -- existence of policy promoting milk industry (Milk Master Plan)
- Threats -- mindset of consumers on the quality of industrial milk, external factors related to the control of the cost of production inputs (feeds, drugs)

Vision, mission, and performance objectives

This policy seeks to regulate the distribution of raw milk to processors in a formal manner that pursue increased income for farmers and ensure prevention of foodborne disease.

Objectives: This policy is intended to achieve following major outcomes:

- Efficient connection between milk producers and processors
- Safe and trusted milk market, accessible and affordable for all category of consumers
- Traceability of raw produce and producers

Key issues addressed include price issues of processed products (consumer), food safety associated with products supplied by the informal market (consumer), fair price to milk producers (farmers) and control the informal market and ensure steady supply to producers (producer)
Harmonize the prices for both raw milk and processed products
Assure compliance with the national food safety standards
Enforce the implementation of the existing regulation for the collection, transportation and selling of milk.

Legal framework

Policy instruments

- National Dairy Policy and Strategy (NDS, 2012); Law N° 32/2002 of 06 November 2002, with regard to animal identification, Official Gazette date on 06 November 2002
- Law N° 54/2008 of 10/09/2008, determining the prevention and fight against contagious diseases for domestic animals in Rwanda
- Law N° 56/2013 of 09/08/2013, establishing Rwanda Council of Veterinary Doctors and determining its mission, organization and functioning
- Ministerial Orders/ Official Gazette n° 50 of 13/12/2010:a-N°008/11.30 of 18/11/2010 Ministerial Order determining the organization of veterinary pharmacy practice, b-)N°009/11.30 of 18/11/2010 Ministerial Order on stray cattle and other domestic animals
- Ministerial order N°001/11.30 of 10/02/2016 regarding the regulation of the collection, transportation and selling of milk.

Policy owner and implementation

The policy shall be implemented by the Rwanda Agriculture Board in close collaboration with the Local Government, acting on behalf of the Ministry of Agriculture and Ministry of Commerce and Trade. The policy shall be valid for 5 years, subjected to review and/or re-approval.

Monitoring and evaluation

The monitoring shall be entrusted with the District Veterinary and Livestock Officers (DVO), who are given the full right and obligations to oversee its implementation at Sector and District levels, The reporting line will involve DVOs, Vice Mayors in charge of Economic affairs and the Head of Division in charge of animal resources. The later will ensure a proper recording and information to RAB senior Management for action. Evaluation will be done by an independent actor (Audit Team), to be hired and reporting to RAB Senior Managers.

Situation analysis

The participants were taken through the situation analysis guide and discussed how to get the data required and the presentation formats. It was agreed in some areas where data may be lacking, they should (country teams) agree on what would be the best expert opinion and indicate the same. After a lengthy discussion with country teams, it was agreed that the exercise to have a zero draft will take maximum 3 months and the teams need to be facilitated to accomplish the exercise.

The country teams requested fast tracking of the facilitation so that they can deliver the zero draft before end of November 2019.

Evaluation of the workshops

Separate approaches were used in the evaluation exercise.

For cohort 1 training, a total of 17 participants were given the course evaluation form (Annex 3) immediately after the training to fill; 16 were duly filled and returned.

The evaluation questionnaire sought find the problems experienced so that we could try and rectify these before the second cohort. Figure 5 shows the assessment of the overall workshop organization. Various elements were rated good to excellent.

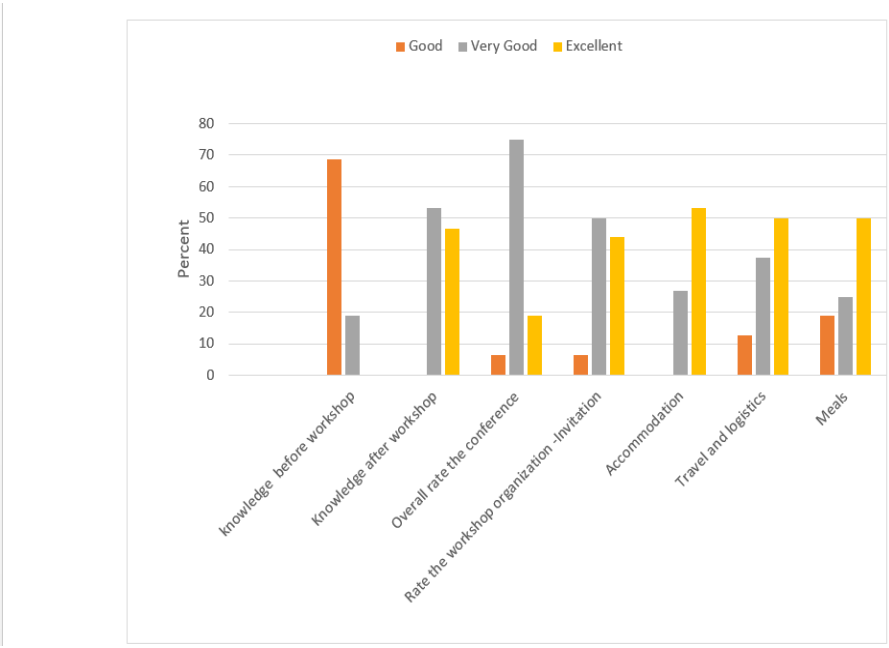


Figure 5: Assessment of the overall workshop organization.

On accommodation, 25% of the participants rated the arrangements made as poor basically because the hotel they were booked into was playing loud music every night making it difficult to have a good night rest. This was considered in arranging for accommodation for the second cohort.

The understanding of course content was also assessed. Figure 6 shows the rating by the participants. Overall, the understanding of the content was rated very good and excellent.

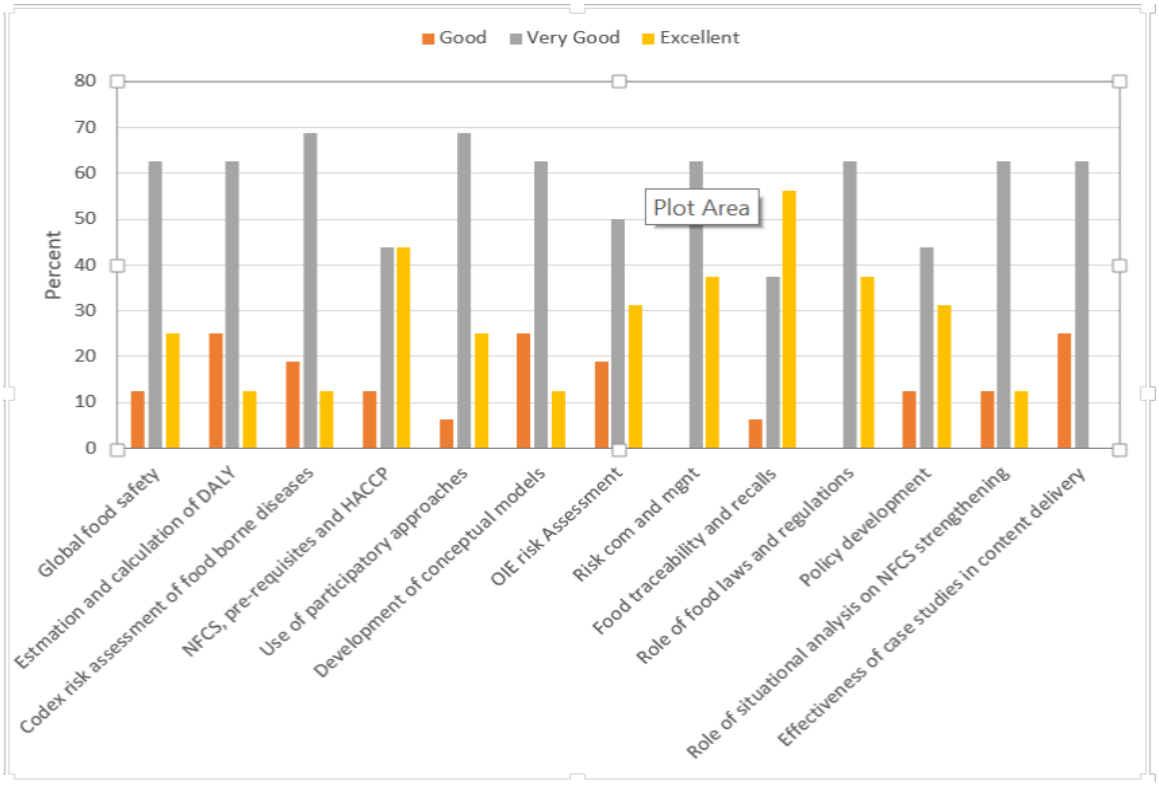


Figure 6: Rating the understanding of the topics by participants after the training workshop.

The only aspect that did not have an excellent score, was the effectiveness of the use of case studies in delivery of the content. The facilitators need to make the case studies more relevant and help the trainees to understand the content better.

Risk communication and management and the role of food laws and regulations were the only two course units that were rated “very good and excellent’

The participants gave the comments anonymously.

- Few logistical concerns were raised
- All the courses were well understood and evaluated as good to excellent.
- The participants requested for a session covering statistical packages like @Risk, Monte Carlo simulation
- The content was well aligned with the region’s needs i.e. to transform into an economic block in Africa.
- Additional topics to be considered in future sessions: - food safety and cultural context, food safety and economics and food safety and health (see comments 10, 12, 14, 19)
- Consider a training program for all colleagues in food safety and especially the meat, milk and fruits and vegetables value chains (consider layers) depending on the specific needs of each country (See 11).
- Consider a free day to visit Addis
- Timetable was well organized, and facilitators were able to deliver what they had planned
- Consider a discussion on inspection guidelines for animal source foods.
- Course could be appropriately scaled up to value chain actors to create the critical mass to deliver food safety
- Consider the concept of Halal food in future courses

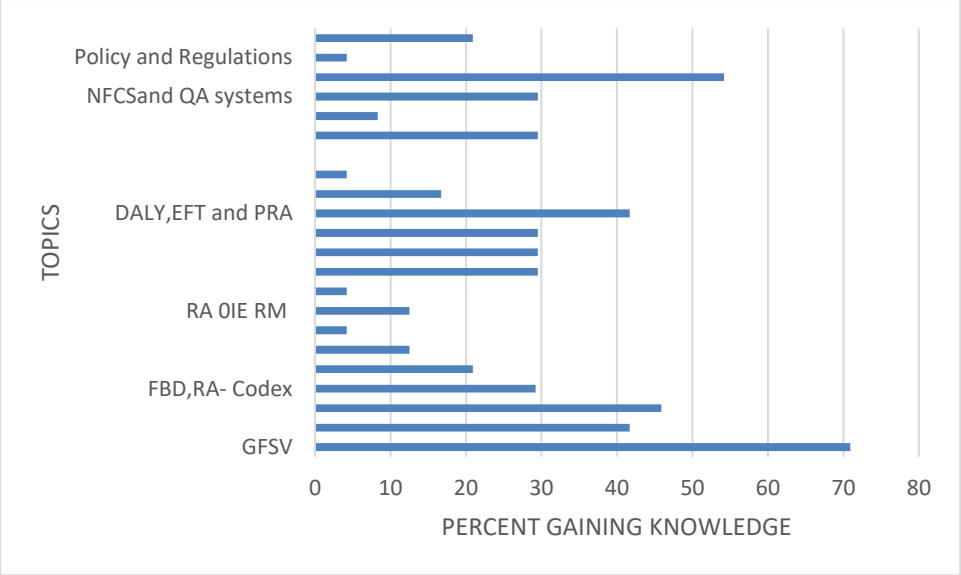
- In future consider splitting groups such that in each session all the partner states are represented to allow a broader sharing and learning from one another.
- Include a lecture on the effects of climate change and global warming on food safety
- Improve on logistics- those accommodated at Bellevue complained of hotel having loud music in the evenings and this was not comfortable
- A case study of how to establish HACCP in a small or medium enterprise would be very good
- ILRI to follow up each team to help in translating the knowledge gained into actions in the respective countries.
- Case studies helped ground the theory. This was a very good approach
- GAP, GMP, GHP and HACCP should be handled in one lecture.
- Facilitators should look at legal tools of the EAC e.g. the Standardization, Quality Assurance, Metrology and Testing Act and standards harmonization, bring participants to be aware of the African Africa Continental Free Trade Area and food safety

After the evaluation of the first cohort, the need to try and quantify change as a result of content delivered in the sessions was realized. This necessitated a separate questionnaire (see Annex 3). The same questionnaire was administered before and after the training. The objective was to assess acquisition of new knowledge following the workshop. An additional questionnaire was used to evaluate the general areas and logistics (like that used in cohort one but with minor changes).

To assess this, the participants were asked to mark the answered questionnaires in a manner to identify the pre and post workshop evaluations answers as belonging to the same person. The marked answers were classified as follows:

- Wrong during pre- workshop evaluation and right post- workshop (WR);
- Wrong pre and wrong post workshop evaluation (WW);
- Wrong pre and do not Know post (WDNK);
- Right answer during pre- workshop and wrong answer post- workshop (RW);
- Right –right at both pre and post workshop evaluation (RR);
- Right pre and do not Know post-workshop evaluation (RDNK);
- Do not Know pre and wrong post workshop DNKW);
- Do not know pre and right post workshop DNKR) and
- Do not know pre and post workshop evaluation (DNKDNK).

The answers that were classified as being WR and DNKR indicated that the participant had no knowledge of the right answer at pre workshop but did gain knowledge during the training to be able to get the right answer to the same question he/she had failed during pre-workshop evaluation. Figure 7 shows the percentage of such participants per question and the respective thematic topic. The thematic area with the highest average uptake was understanding of the global food safety (56.2%) followed by National food safety control systems and quality assurance (41.9%); policy, food laws and regulations (31.5%); risk assessment (OIE) and risk communication and management (21.2%); DALY, conceptual framework models and participatory risk assessment (20.2%) and foodborne disease, risk assessment codex format (16.9%). This clearly demonstrated the training did increase the knowledge of the participants, therefore met its objective of capacity building in food safety.



Key: GFSV: Global food safety view; FBD,RA-Codex: Foodborne diseases and risk assessment (Codex); RAOIE RM: Risk Assessment (OIE) and Risk Management; DALY,EFT and PRA: disability-adjusted life years, event and fault trees and participatory risk assessment; NFCS and QA systems: national food control systems and quality assurance systems.

Figure 7: The percentage of participants who were found to have gained knowledge on each question after post workshop evaluation.

The assessment of the general organization and usefulness of the workshop was evaluated at the end of the second workshop. Twenty-four fully answered questionnaire on general issues. Twenty nine percent rated the workshop generally as excellent, 67% very good, and 4.2% good. Eighty three percent rated the workshop as having fully met their expectations, 8.3% meeting expectations partially and exceeded expectations respectively. About 90% indicated that the workshop objectives were clearly explained.

The following topics: ISO 2000 implementation strategy; setting of microbiological criteria; prioritization of risk hazards; epidemiology (disease prevalence incidence etc.); food safety in fruits and vegetables, antimicrobial residue in Animal source foods were listed as new topics to be included in future training workshops. Risk assessment models such as R and @Risk which was just introduced should be covered in depth.

The participants requested the trainers to relook at their training materials and remove all the repetitions. Although a demonstration of Statistical package R was demonstrated, the participants requested it be removed if no in-depth training on this and other packages is planned.

The participants described this training workshop as well organized, participatory, beneficial and practical and task oriented and one that enhances food safety skills. The duration is long, and trainers should look at how to reduce the training time.

Group work discussions (Cohort 2)

Cohort 2 group photograph (Ethiopia, Kenya, Tanzania South Sudan country teams and EAC representative)

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Annex 1: Workshop program

TIME	DAYS					
	MONDAY 8/7/19	TUESDAY 9/7/19	WEDNESDAY 10/7/19	THURSDAY 11/7/19	FRIDAY 12/7/19	SATURDAY 13/7/19
0800-1000	Registration, Welcome and Housekeeping [ILRI]	Partnership for Aflatoxin Control in Africa Global Food Safety Partnership	Risk Analysis – Risk Assessment {Codex} [Nasinyama]	Risk Assessment – OIE [Amenu]	Risk Management –use of multiple factors [Amenu]	Visit to Addis meat and vegetable markets [Amenu]
1000 - 1030		TEA BREAK				
1030-1230	Introduction: Aims and objectives [Kangethe]	Food borne infections –ASF, FFV [Nasinyama]	Risk Assessment [Nasinyama]	Risk Communication [Amenu]	Risk Management-use of Multiple factors [Amenu]	
1230-1400	LUNCH BREAK					
1400-1600	Global food safety view [Kangethe]	Food borne Intoxications [Nasinyama]	Microbiological Risk Assessment [Nasinyama]	Risk Communication [Amenu]	Risk Analysis-case Study [Mutua]	
1600-1630	TEA BREAK					
1630-1730	Global food safety View [Kangethe]	Introduction to Risk Analysis [Nasinyama]	Microbiological Risk Assessment-Case Study [Nasinyama]	Risk Management - Use of multiple factors [Amenu]	Risk analysis – Case Study [Mutua]	

TIME	DAYS					
	MONDAY 15/7/19	TUESDAY 16/7/19	WEDNESDAY 17/7/19	THURSDAY 18/7/19	FRIDAY 19/7/19	SATURDAY 20/7/19
0800-1000	Participatory Risk Assessment [Mutua]	HACCP and Industry programs [Kazwala]	Food safety traceability and Recall systems [Kurwijila]	Policy formulations [Kurwijila]	Work on Situation Analysis [Kangethe]	Departure
1000 - 1030	TEA BREAK					
1030-1230	Conceptual framework models [Mutua]	Setting up food safety control systems [Kazwala]	Food safety traceability and Recall systems [Kurwijila]	Policy formulations [Kurwijila	Work on Situation Analysis [Kangethe]	
1230-1400	LUNCH					
1400-1600	Food safety assurance programs-GHP, GMP, GAP [Kazwala]	Setting up food safety control systems [Kazwala]	Food laws –ASF, FF&V [Kurwijila]	Food safety activities in the EAC [Marwa/Balikowa}	Work on Situation analysis [Kangethe]	
1600-1630	TEA BREAK					
1630-1730	HACCP, Industry programs [Kazwala]	Case Study – HACCP [Kazwala]	Food laws –ASF, FF&V [Kurwijila]	Work on Situation Analysis [Kangethe	Work on Situation analysis [Kangethe	

Annex 2: List of participants (Cohort 1)

Name	**Position**	**Country**
Daniel Nyandwi	Teaching -Assistant at the University of BURUNDI/ Facility at the Faculty of Agronomy and Bioengineering	Burundi
Alfred Nduwimana	Burundi Bureau of Standard and Quality Control	Burundi
Sanctus Niragira	Lecturer/ Researcher -University of Burundi	Burundi
Robert Muvunyi	Lecturer at the University of Burundi	Burundi
Deo Ndikumana	PhD- University of Burundi/Faculty of Agronomy and Bio-engineering/Department of Crop Science and Production	Burundi
Didace Nzigamasabo	Medicine Doctor, Health Ministry	Burundi
Anselme Shyaka	Lecturer University of Rwanda	Rwanda
Jerome Ndahimana	Rwanda Standards Board (RSB)Ag. Director of Food and Agriculture, Chemistry and Environment Standards Unit	Rwanda
Eugene Niyonzima	University of Rwanda, Food Science and Technology department, Lecturer	Rwanda
Martin Ntawubizi	Dean, University of Rwanda school of Veterinary Medicine	Rwanda
Christine Mukantwali	MINAGRI-RAB	Rwanda
Clovice Kankya	Makerere University	Uganda
Jolly Justine Hoona	Principal Veterinary Officer MAAIF- Public Health	Uganda
Nanyanzi Josephine	Principal Regulatory Officer - Vet Medicine, Directorate of Product Assessment and Registration, National Drug Authority	Uganda
Arthur Mukanga	Standard Officer Uganda National Bureau of Standards	Uganda
Titus Mukungu	Veterinary Inspector, Ministry of Agriculture, Animal Industry and Fisheries	Uganda
Silvia Nantongo	Senior Agricultural Inspector Ministry of Agriculture, Animal Industry and Fisheries- Crop Resources Directorate	Uganda
Fahari Marwa	Principal Agricultural Economist, EAC Secretariat	Tanzania
George Nasinyama	Professor, Kampala International University (Deputy Vice Chancellor)	Uganda
Lusato Kurwijila	Sokoine University of Agriculture	Tanzania
Rudovick Kazwala	Sokoine University of Agriculture	Tanzania
Kebede Amenu	Addis Ababa University	Ethiopia
Erastus Kangethe	ILRI	Kenya
Florence Mutua	ILRI	Kenya
Rosekellen Njiru	ILRI	Kenya

Annex 3: List of participants (Cohort 2)

Name	Position	Country
Kiri Andrew	University of Juba –Food Science	South Sudan
Sandra Balet	University of Juba – Agriculture	South Sudan
Lomoro Philip Amando	University of Upper Nile	South Sudan
Khamis Isharaga	University of Upper Nile -Agronomy	South Sudan
Clara Lumori	University of Juba	South Sudan
Kuorwei Kuai	Public health	South Sudan
John Kang	Livestock	South Sudan
Peter Baaro Gathura	University of Nairobi	Kenya
E.N. Muthuma	Ministry of Agriculture - Veterinary Services	Kenya
Brendah Oburah	Ministry of Health - Food Safety	Kenya
Bartholomew Mkanga	Kenya Dairy Board	Kenya
Lolokote Sainyugu	Kenya Meat Commission	Kenya
Robert Koigi	Kenya Plant Health Inspectorate services	Kenya
Naomi Mariach	Kenya Bureau of Standards	Kenya
Abiot Deddefo	Arsi University	Ethiopia
Miseret Bekele	Ministry of Agriculture - Veterinary	Ethiopia
Gebremichael Addisu	Ministry of Agriculture - horticulture	Ethiopia
Muluken Aschalew	Ethiopian Meat and Dairy Institute - dairy	Ethiopia
Workneh Bedane Kunbi	Ethiopian Standard Agency	Ethiopia
Samson Girma	Ethiopian Public Health Institute	Ethiopia
Sileshi Yaserah Ademe	Ethiopian Meat and Dairy Institute - Meat	Ethiopia
Joseph Bazili Tarimo	Standards Officer Tanzania Bureau of Standards	Tanzania
Mark Laizer	Sokoine University of Agriculture	Tanzania
David Balikowa	Senior Livestock Officer EAC	Tanzania
Rashid A. Suleiman	Sokoine University of Agriculture	Tanzania
Beatrice M. Kilima	Sokoine University of Agriculture	Tanzania
Athuman Lupindu	Sokoine University of Agriculture	Tanzania
George Nasinyama	Kampala International University	Uganda
Lusato Kurwijila	Sokoine University of Agriculture	Tanzania
Rodovick Kazwala	Sokoine University of Agriculture	Tanzania
Kebede Amenu	Addis Ababa University	Ethiopia
Theodore Knight-Jones	ILRI	Kenya
Erastus Kangethe	ILRI	Kenya
Rosekellen Njiru	ILRI	Kenya

Annex 4: Pre- and post-workshop evaluation

INSTRUCTIONS

A. Please attempt all questions.
B. If you are not **certain of the answer** to any question, please leave it unanswered.
C. Write your Initials (First name and Surname) and your country First Letter, e.g. **E K; K**. on top of the first page.

1. Which is the most commonly used metric for estimation of foodborne disease burden?

   a. Number of illness cases
   b. Number of deaths resulting from foodborne disease
   c. Disability adjusted life years

2. In your own view, how big is the burden of foodborne diseases, globally?

   a. Comparable to the burden caused by malaria, HIV AIDS and Tuberculosis
   b. Comparable to that caused by cancer
   c. Comparable to that caused by radioactive contamination of environment

3. Who bears the highest burden of foodborne disease burden in Sub Saharan Africa?

   a. Adults
   b. People living with HIV/AIDS
   c. Children below 5 years

4. What is the most commonly reported foodborne intoxication in the East African region?

   a. Botulism
   b. Aflatoxicosis
   c. Staphylococcal food poisoning
   d. Poisonous shellfish

5. The sanitary and phytosanitary measures undertaken by any country must be:

   a. Based on science
   b. Transparent
   c. Not restrictive to trade
   d. All the above

6. In risk analysis, we focus on:

   a. Environment
   b. Industry
   c. Host
   d. Food matrix
   e. All the above

7. Decisions related to food trade should be based on:

   a. HACCP
   b. OIE/WHO
   c. Risk assessment
   d. Country policies
   e. All the above

8. Which of the following **does not** represent a hazard in import risk analysis of livestock or livestock products?

   a. Absence of a given agent of concern in the importing country
   b. Absence of a given agent of concern in the exporting country
   c. Presence of more virulent strains of a given pathogen in the exporting country compared to the importing country

9. According to OIE import risk analysis framework, assessment of the likelihood of the potential health or economic adverse effects of a given hazard is:

    a. Risk management
    b. Risk communication
    c. Hazard identification

10. Identify **wrong statements** about food safety risk communication:

    a. The goal of food safety risk communication is to provide meaningful, relevant and accurate information, in clear and understandable terms targeted to a specific audience about the risk.
    b. The prior perception about a given food safety risks can positively or negatively influences the effectiveness of risk communication
    c. Communicating only the final report of a risk analysis result to stakeholders is generally an acceptable procedure
    d. Consideration of socio-cultural factors is crucial in food safety risk communication to bring the intended outcomes

11. Which of the following **statements are possibly** unintended outcome of risk communication in case of bacterial disease outbreak potentially associated with raw milk?

    a. Strict boiling of raw milk before consumption
    b. Stopping consumption of any milk or milk products by consumers
    c. Only consuming pasteurized milk during the outbreak
    d. If milk boiling or pasteurization was not possible, avoiding raw milk consumption by pregnant women

12. Which of the following **are true** regarding risk management?

    a. In food safety risk management, a decision based on many factors is better than the one based on single factor.
    b. In food safety risk analysis, risk management is the role of risk assessor
    c. Risk communication has no role on the effectiveness of risk management
    e. Managing food safety risk should not be implemented until final confirmation about the cause of a given food safety problem is identified.

13. What does **DALY** stand for? (NB: there may be more than one correct answer)

    a. Disability Adjusted Lost Years
    b. Discounted Ability Lost Years
    c. Disability Adjusted Life Years
    d. Discounted Ability Lost Years

14. Which of the following statement(s) is/are correct? (NB: there may be more than one correct answer)

    a. We use DALYs to describe the number of deaths attributable to a disease?
    b. We use DALYs to describe the number of cases attributable to a disease?
    c. We use DALYs to compare the burden of disease for different diseases?
    d. We use DALYs to compare disease severity in different settings?

15. Fault Tree Analysis is? (NB: there may be more than one correct answer):

    a. A quantitative method for analysing the causes of unwanted outcomes. It is not a qualitative method
    b. A qualitative method for analysing the causes of unwanted outcomes. It is not a quantitative method
    c. A qualitative or quantitative method for analysing the causes of unwanted outcomes
    d. Can be used to understand the events that contribute to accidents resulting from faulty trees

16. Event Tree Analysis is? (NB; There may be more than one correct answer)

    a. Is a method for assessing risks of consequences arising from an event
    b. Is normally used to understand the causes of unwanted events
    c. Is normally used to understand how to mitigate against consequences arising after an event
    d. Could be used to assess how to reduce the damage caused when branches fall off faulty trees

17. In risk assessment, participatory methods are well suited for--- (NB, there may be more than one correct answer

    a. Dose-response modelling
    b. Exposure assessment

c. Risk communication
d. Sensitivity analysis

18. Participatory risk assessment is

a. Part of the OIE risk assessment framework
b. Part of the Codex Alimentarius risk assessment framework
c. Can be complementary to a conventional risk assessment
d. Can be used to quantify risks

19. In many countries, effective food control is undermined by the existence of;

a. sound legislations
b. multiple jurisdictions
c. appropriate food surveillance systems
d. good governance

20. Previously, the food safety assurance system relied on two types of measures:

a. HACCP and Good manufacturing practices
b. Good laboratory practices and good legislations
c. Good Hygienic Practice and the "end-product" testing
d. HACCP and functional Bureau of Standards

21. Food recalls are more common in developed countries than in developing countries because: TRUE/FALSE tick✓

a. Consumers are more sensitive to food safety TRUE ☐ FALSE ☐
b. Regulatory surveillance is more effective TRUE ☐ FALSE ☐
c. Food manufacturers care more about their profits TRUE ☐ FALSE ☐
d. Consumers in developing countries do not care about food safety issues TRUE ☐ FALSE ☐
e. Food manufacturers cannot trace one step backward or forward the food items they sell TRUE ☐ FALSE ☐

22. Food laws are meant to: TRUE/FALSE tick✓

a. Protect the food manufacturers TRUE ☐ FALSE ☐
b. To ensure food is not too costly TRUE ☐ FALSE ☐
c. To raise income for regulatory agencies TRUE ☐ FALSE ☐
d. Food consumers do not fall sick through food they eat TRUE ☐ FALSE ☐
e. To protect domestic markets from imported food products TRUE ☐ FALSE ☐

Annex 5: General post-workshop evaluation (Cohort 2)

Your co-operation in completing this questionnaire will be greatly appreciated. The information you provide will be useful in planning future events and will help resource persons to improve their materials and presentation.

A1. General Assessment	In general, I would rate the workshop as: ☐ Excellent ☐ Very Good ☐ Good ☐ Poor ☐ Very Poor
B. How would you rate this workshop in meeting your expectations? ☐ Partially ☐ Fully **%** ☐ Exceeded Please explain (if the workshop did not fully meet your expectations only)	
C. Were the training objectives clear? ☐ Fully ☐ Partially ☐ No	
D. Additional topics	What additional food safety topics would you have liked included in this training course in future?
E. Topics to be eliminated	In your opinion what topics should be considered for elimination?
F. How useful is this training for your day to day work? On a scale of one to five (1=not useful; 5=very useful) Please rate the usefulness. 1 2 3 4 5	
G. Will you be able to train others in what you learnt? ☐ Yes ☐ No ☐ I am not sure	
H. How would you rate your knowledge and skills on this subject after the training? (Use a scale of 1-5, One being very low to Five being very high) 1 2 3 4 5	
I. Would you recommend this workshop to your colleagues? Yes ☐ No☐ Please explain	
J. Any additional comments	Please use the space below to write down any additional comments you may have.

Thank you very much for your valuable input