

Voice for Change Partnership

Report on: Prioritization of Food Safety Issues in the Dairy and Horticulture Value Chains, Kenya



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November 2019

ILRI, Nairobi

Table of Contents

| | |
|--|-----|
| Abbreviations and acronyms | iii |
| Acknowledgement | iv |
| We gratefully acknowledge funding from the Dutch Government through SNV and the Voice for Change Partnership (V4CP) Programme..... | iv |
| Executive summary | v |
| Introduction | 1 |
| Food Safety | 1 |
| Food safety and Food Loss | 2 |
| Food safety and Trade | 2 |
| Horticulture and Dairy Value Chains | 2 |
| Purpose of engagement | 3 |
| Methods | 3 |
| Results | 4 |
| Limitations | 4 |
| Criteria for prioritization of food safety issues | 4 |
| Food safety issues | 5 |
| Criteria weighting | 5 |
| Prioritization of the food safety issues | 6 |
| Horticulture value chain | 6 |
| Dairy value chain | 7 |
| Observations | 9 |
| Recommendations | 10 |
| References | 11 |
| Annexes | 13 |
| LIST OF PARTICIPANTS | 13 |
| WORKSHOP PROGRAMME..... | 15 |

Abbreviations and acronyms

ACTS – African Centre for Technology Studies

AFA – Agriculture and Food Authority

CSO – Civil Society Organization

DALYs – Disability Adjusted Life years

FAO – Food and Agriculture Organisation of the United Nations

FERG - Foodborne Disease Burden Epidemiology Reference Group

GAP – Good Agricultural Practices

GDP – Gross Domestic Product

ILRI – International Livestock Research Institute

KEBS – Kenya Bureau of Standards

KEPHIS – Kenya Plan Health Inspectorate Service

KNBS – Kenya National Bureau of Statistics

KPLA - Kenya livestock producers association

RDV – Relative Decimal Value

ReSAKSS - Regional Strategic Analysis and Knowledge Support System

RETRAK - Retail trader's association of Kenya

SNV – Netherlands Development Organization

SPS – Sanitary and Phytosanitary Standards

WHO – World Health Organisation

WTO – World Trade Organisation

Acknowledgement

We gratefully acknowledge funding from the Dutch Government through SNV and the Voice for Change Partnership (V4CP) Programme.

Executive summary

Food borne diseases can be caused by biological, chemical and physical hazards. Most food borne illnesses result from consumption of animal source foods and fruits and vegetables. Managing food borne illness requires establishment of food safety control systems. In resource poor countries, it imperative that prioritization of the causes of food borne illness be done to have better resource allocation and utilization.

A team of experts drawn from dairy and horticulture value chains listed the key food safety hazards in the dairy and horticulture value chains. A multi-criteria approach was used to prioritize the food safety hazards and associated aspects of food loss and trade.

Microbial hazards were ranked highly in both value chains. This is a reflection of poor agricultural and post-harvest handling practices of the commodities. Considering the dominance of smallholder production in the two value chains, observance of good agricultural and hygienic practices is challenging along value chains that have many nodes and actors.

The situation can be addressed through capacity building and adoption of good agricultural and hygienic practices, enforcement of food safety standards and provision of appropriate infrastructure development along the value chains.

Introduction

Food Safety

Food safety has been defined as the handling, storing and preparation of food to prevent infection and help to ensure it keeps enough nutrients to provide a healthy diet (FAO, 2010). Food borne illnesses whether acute or chronic are caused by biological, chemical and or physical hazards.

There is heightened global realization of the significance of food safety in health and trade. The World Food Summit (FAO, 2009) reaffirmed its commitment to the previous obligations and affirmations (FAO/WHO, 1992; WHO, 1994) that it is a fundamental human right to access nutritious and safe food. It additionally noted that food security can only exist if the food is safe and observed that over 1 billion people globally and particularly in developing countries were food insecure. Some schools of thought feel this heightened focus on food safety is driven by high end consumers in developed countries and does not take into account the realities of food safety in developing countries. They argue that this takes away resources from agricultural production and rural development. The alternative thought is that improvements in food availability will not benefit many of those at nutritional risk without corresponding improvements in the nutritional quality and safety of food as well as a reduction in food and water-borne illnesses (Unnevehr, 2003).

The FAO/WHO (1984)], expert committee on Food safety observed that food is an important vehicle for diarrheal diseases and recommended that appropriate corrective measures need to be taken to eliminate the hazards in the food chains. Illnesses from contaminated food are an important cause of reduced productivity. The WHO Food Borne Disease Epidemiology Reference Group (WHO, 2015) reported that 31 foodborne hazards investigated resulted in 33 million DALYs in 2010. This clearly demonstrates the impact of contaminated foods on health. Approximately 1.5 billion episodes of foodborne diarrheal cases occur annually in children under the age of 5 resulting in some 1.8 million deaths mostly caused by non-typhoidal Salmonella, *Salmonella typhi*, *Enteropathogenic E.coli*, *T. solium*, Norovirus and *Campylobacter* spp (WHO, 2015).

In Sub-Saharan Africa, 91 million cases of food borne diseases have been estimated to occur annually resulting in about 137,000 deaths (WHO, 2015). Diarrheal diseases due to Non-typhoidal Salmonella, food cholera and *E.coli* make 70% of the burden of disease. Parasitic diseases were estimated to cause about 407 million illness cases, resulting in 94,000 deaths and 11.8 million DALYs globally and those attributable to foodborne were 91 million cases of illness, 52,000 deaths and 7.2 million DALYs. (Torgerson et al, 2015).

For the African region, enteric parasites excluding protozoa, caused about 418,000 cases/100,000 food borne illnesses and 2 deaths/100,000 incidences of foodborne illnesses (Torgerson et al 2015). Chemicals and toxins also contribute to global foodborne burden of disease. Chemicals (aflatoxin, Dioxin, peanuts allergens and cyanide in cassava) were estimated to cause 339,000 illness cases, 20,000 deaths and 1 million DALYs, with Africa experiencing 0.7 illnesses/100,000 cases, 0.4 deaths/100,000 and 18 DALYs (WHO, 2015).

Food safety and quality are therefore essential for food security, public health and economic development. Improving food safety is necessary to increase food security. The African Union has prioritized agricultural transformation as a vehicle for shared prosperity and improved

livelihoods (Malabo Declaration, 2012). The countries have focused on food production and sufficiency to ensure availability, but food safety has been given lesser focus. Food safety is important for both domestic and high value global food markets. The Malabo declaration has placed high importance on tripling intra African trade by 2025, it is imperative to reasonably assure the safety of food traded. Although food safety regulations and standards are not trade metrics per se, they can impede trade and significantly affect the ability of developing countries to access markets, particularly those in industrialized countries. The sanitary and Phytosanitary agreement (SPS) of World Trade Organization (WTO) does not permit use of food safety as non- tariff barriers to deny poor countries access to markets.

Food safety and Food Loss

Food losses refer to the decrease in edible food mass throughout the part of the supply chain that specifically contributes to edible food for human consumption. Food losses take place at production, postharvest and processing stages in the food supply chain (Parfitt et al., 2010). About a third of the food produced or about 1.3 billion tonnes/ year is lost (FAO, 2011). Per capita food losses are higher in the developed countries (280 -300 Kg/year) than in Sub-Saharan Africa and South/Southern Asia (120 -170 kg/year), (FAO, 2011, a). For fruits and vegetables (horticulture) the loss is mainly due grading occasioned by retailers' standards. In the dairy sector, losses constitute about 3-4% of the production, in developing countries the loss is mainly due to mastitis and post- harvest handling. Higher food loss directly reduces the available supply of food and have a direct impact on food security. Food safety is never a concern of a population suffering from food insecurity (hunger). (FAO 2013) estimated that 842 million people are faced with famine and 227 million come from Africa. With this massive food loss, this population could be easily fed (Gustavsson, 2011).

Food safety and Trade

Food safety regulation in many countries is through use of process [how the product should be produced – GAP], product performance (requires that the product should have specific characteristics), or information standards (specifies the type of labelling or information that accompanies the product for the consumer) (Caswell, 2003). As food safety regulations become more stringent, countries in the developing world will have their products either banned from the lucrative markets and when they try to meet these standards, their competitiveness may be diminished by high cost of compliance (Henson, 2003). This can be damaging for export-oriented countries. The strict regulations on fresh produce [vegetables] export from Kenya to European Union have forced the exporters to source the produce from few large farmers than smallholder farmers. This has had negative effects of shutting out poor producers whose ladder out of poverty has been blocked. This will also significantly cause changes on how the agricultural product systems operate (Henson, 2003). Otsuki, Wilson and Manjundar (2002) found that increasing strictness of the allowable maximum residue limits for tetracycline by 10% (from 6 importing and 14 exporting countries) would decrease beef imports sales by 5.9%.

Horticulture and Dairy Value Chains

Agriculture is the mainstay of Kenya's economy contributing up to 24 percent (Kshs. 342 billion) of Gross Domestic Product (GDP) directly and another 27 percent (Kshs. 385 billion) indirectly (KNHP, 2012).

The horticulture sub-sector contributes an estimated 36 percent of the agricultural GDP and with growth rates of between 15 and 20 percent per year is an inspiring success story.

Horticulture is among the leading foreign exchange earners and contributes enormously to food security and household incomes to a majority of Kenyan farmers (KNBS, 2012). Large-scale growers dominate commercial export horticulture while the majority of horticultural growers (about 80%) are small-scale farmers targeting the domestic market. The flower exports contributed US\$523 million, or 69% of the earnings, with the rest 31% coming from the export of fruits and vegetables (Match Maker associates, 2017).

The dairy sub-sector, on the other hand contributes about 6-8% of the GDP (KAVES 2014) and about 30% of the agricultural GDP, making it a key player in the country's economy (KNLP 2008). Kenya boasts the largest and most developed dairy sub-sector in sub-Saharan Africa. Like horticulture, the dairy sub-sector is dominated by small holder producers who constitute 70% of the gross marketed production (FAO, 2011, b). Of the total combined (camel, cow and goat) milk production (5.2 billion liters, FAO, 2016), only 20% of Kenya's milk is marketed through formal (licensed) channels. Most of the milk is marketed unprocessed through informal (unlicensed) channels. As a consequence, food safety issues are continuing concerns.

The predominance of small-holders in both horticulture and dairy sub-sectors poses practical, structural and procedural challenges to the management and enforcement of food safety standards in Kenya. This is of special concern to the domestic market which, unlike the export market, is less stringently regulated, often lacks effective standards and appropriate stakeholder organization to facilitate enforcement.

Purpose of engagement

The purpose of this assignment was to prioritize food safety issues in the dairy and horticulture value chains and their associated effects on food loss and trade. The prioritization was done by industry players and experts (See list of participants: Annex I).

Methods

The study adopted a multi-criteria prioritization approach (Van der Flels-klerx et al 2018). More specifically this study adapted the Minnesota Department of Health prioritization matrices approach (<http://www.health.state.mn.us/divs/opi/qi/toolbox/prioritizationmatrix.html>).

The main steps are: -

- i). Agreeing on the criteria to use to prioritize food safety issues.
- ii). Weighting the criteria

The rating was done by creating a matrix and comparing the criteria against another and asking of the criteria on the left, is more important than the criteria on the top. Then a weight was given depending on the level of importance. More important = 10, equally important = 5, less important = 1. On the row, a whole number was entered and on the column a reciprocal was entered. Row totals were obtained and the grand total. The row total was divided by the grand total to get the Relative Decimal Value (RDV). Horticulture had three groups and dairy two groups. An average RDV for each criterion was calculated and used as the weight for each criterion.

- iii). Agree on the food safety issues to be prioritized
- iv). Weighting the food safety issues against criteria

All the listed issues were weighted against each other on all the six criteria. The weights were allocated as above, row totals and RDV calculated for each criterion. Six different RDVs for each food safety issues were obtained and an average RDV obtained depending on the number of groups (three for horticulture and 2 for dairy).

- v). Weighing the food safety issues against the weighted criteria.

A summary matrix was constructed and the averaged RDV for each food safety issue per criterion was multiplied with the criterion RDV (weight), the row and grand totals calculated. Finally, RDV was calculated for each food safety issue which give the relative importance of the food safety issue based on all the six criteria used in the prioritization.

- vi). Developing the final priority list of the food safety issues

The RDV were finally arranged in order (greatest to smallest).

Results

Limitations

The result of this study does not holistically look at food loss and trade issues per se but considered food loss as a consequence of food safety concerns. In this regard consideration was on the contribution of food safety to food loss in general. The study also considered the contribution of food safety issues to loss of trade opportunities in the domestic and export markets without segmentation of the different value chains in the dairy and horticulture sectors.

Criteria for prioritization of food safety issues

In developing the criteria to use, the main effect of lack of food safety is the food borne illness that result from the biological, chemical and physical hazards. Instead of considering food borne illness in general, the workshop agreed to decompose food borne illnesses into prevalence of the hazards, frequency of the illnesses, severity of the illness and longevity. Food loss and trade were considered among the criteria as discussed above. Table I shows the agreed criteria.

Table I: Criteria for prioritizing food safety issues.

| Selected Criteria |
|--------------------------|
| Prevalence |
| Frequency |
| Severity |
| Longevity |
| Food loss |
| Trade |

Food safety issues

The participants in the two agriculture sub sectors agreed on the following list of food safety hazards (Table 2), which were further debated on during plenary and finally adopted.

Table 2: List of food safety issues for prioritization

| Hazard type | Dairy Value chain | Horticulture value chain |
|--------------------|--------------------------|---------------------------------|
| Biological | Hepatitis A, | Norovirus |
| | E.coli; | Hepatitis A, |
| | Salmonella spp; | Toxoplasma gondii |
| | Listeria momocytogenes | E. coli[zoonotic] |
| | Shigella spp | Salmonella spp; |
| | Staphylococcus spp | Listeria monocytogenes |
| | Coliforms | Shigella spp |
| | Campylobacter spp | Staphylococcus |
| | Bacillus Cereus | Coliforms |
| | Coxiella burneti | Campylobacter spp |
| | Mycobacterium spp | Taenia spp, |
| | Yersinia spp | Ascaris spp. |
| | Brucella spp | Entamoeba spp. |
| Chemicals | Heavy metals | Heavy metals |
| | Preservatives | Additives |
| | Antimicrobial residues | Nitrates accumulation |
| | Pesticide residues | Calcium carbide |
| | Detergents | Pesticide residues |
| | Aflatoxins | |
| | Allergens | |
| | Dioxins | |
| | Benzopyrenes | |

Criteria weighting

The participants weighted the criteria with the sector in focus. Table 3 shows the weighting of criteria for each value chain.

Table 3: Weighted criteria values for all food safety issues in the two value chains

| DAIRY VALUE CHAIN | | HORTICULTURE VALUE CHAIN | |
|-------------------|--------|--------------------------|--------|
| CRITERIA | Weight | Criteria | Weight |
| PREVALENCE | 0.416 | Prevalence | 0.28 |
| FREQUENCY | 0.231 | Frequency | 0.20 |
| SEVERITY | 0.168 | Severity | 0.26 |
| LONGEVITY | 0.089 | Longevity | 0.17 |
| FOOD LOSS | 0.072 | Food loss | 0.07 |
| TRADE | 0.024 | Trade | 0.002 |

Prioritization of the food safety issues

Horticulture value chain

Figure 1 shows the hierarchy of horticulture food safety issues weighted against all the six criteria. Biological hazards are the top food safety issues. These are mainly contaminants from poor agricultural and commodity handling practices.

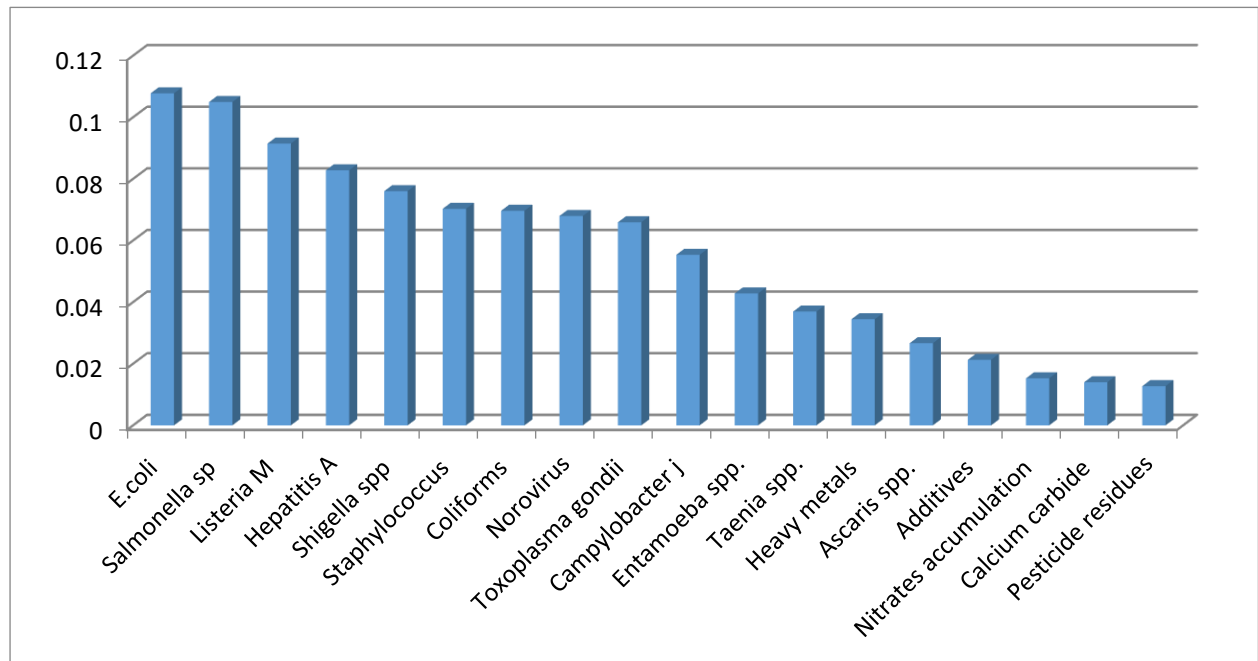


Figure 1: Hierarchy of horticulture food safety issues based on combined six criteria

The same horticultural food safety issues were prioritized using trade and food loss lenses. Figures 2 and 3 respectively reveal that biological hazards (bacteria) are the most important.

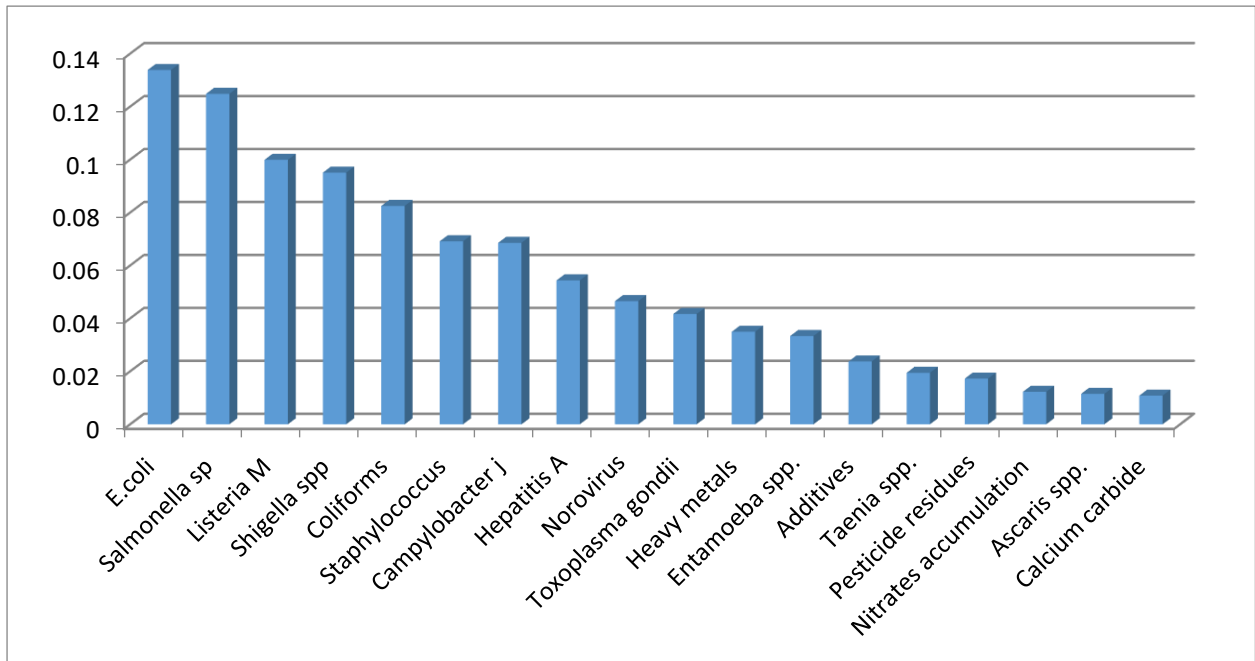


Figure 2: Prioritization of food safety issues in horticulture based on trade concerns

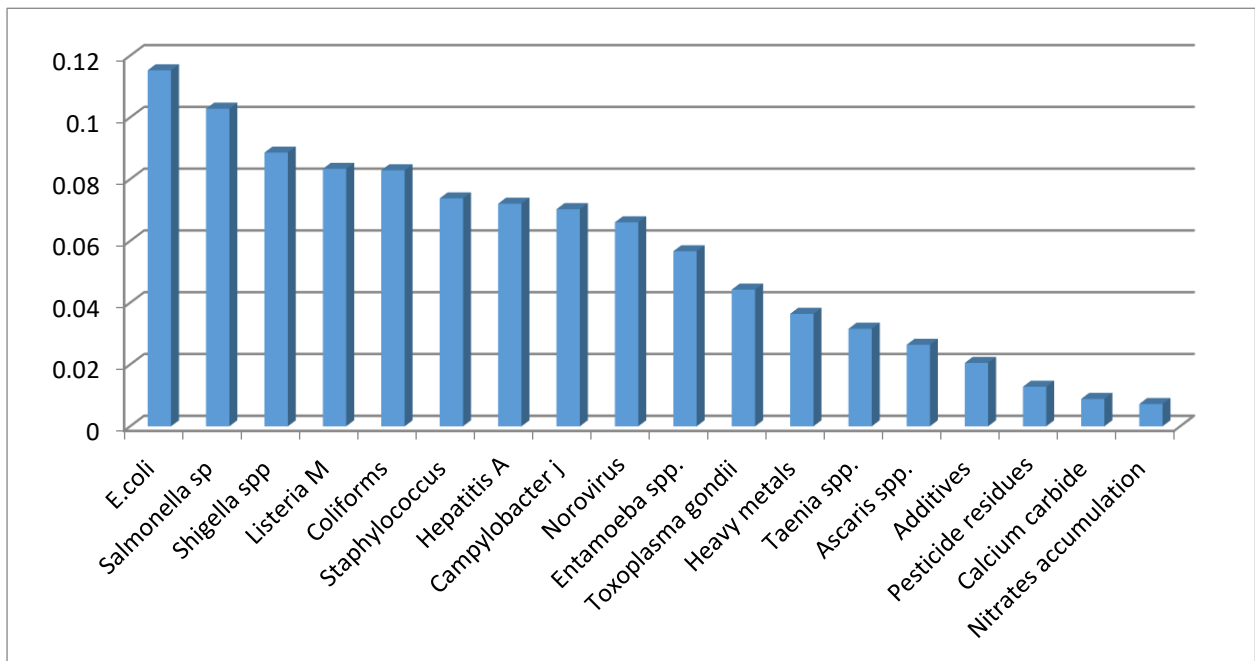


Figure 3: Prioritization of food safety issues in horticulture based on food loss criteria

Dairy value chain

Figure 4, 5 and 6 show the prioritization of dairy value chain food safety issues on the combined six criteria, trade and food loss criteria respectively.

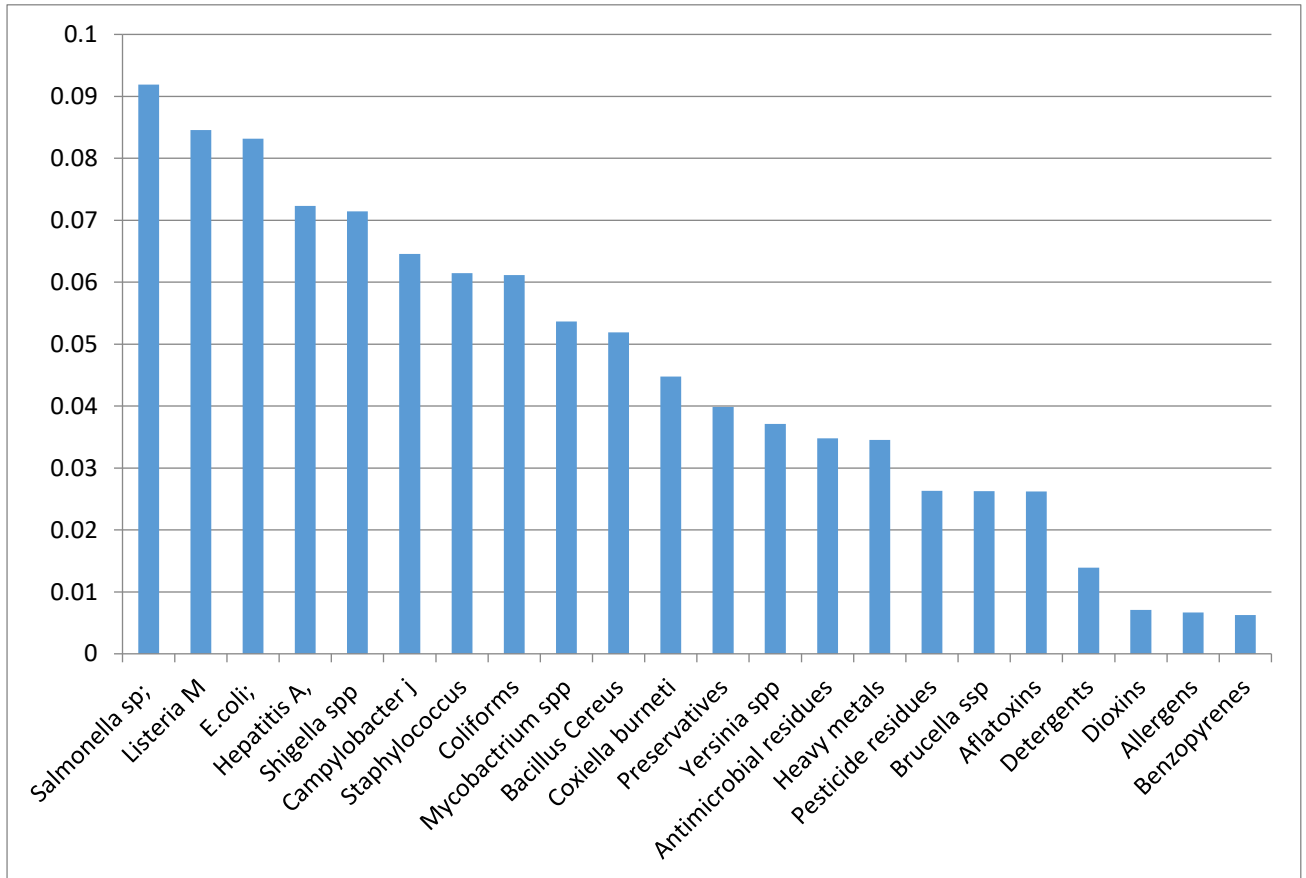


Figure 4: Prioritization of dairy value chain food safety issues on all combined six criteria

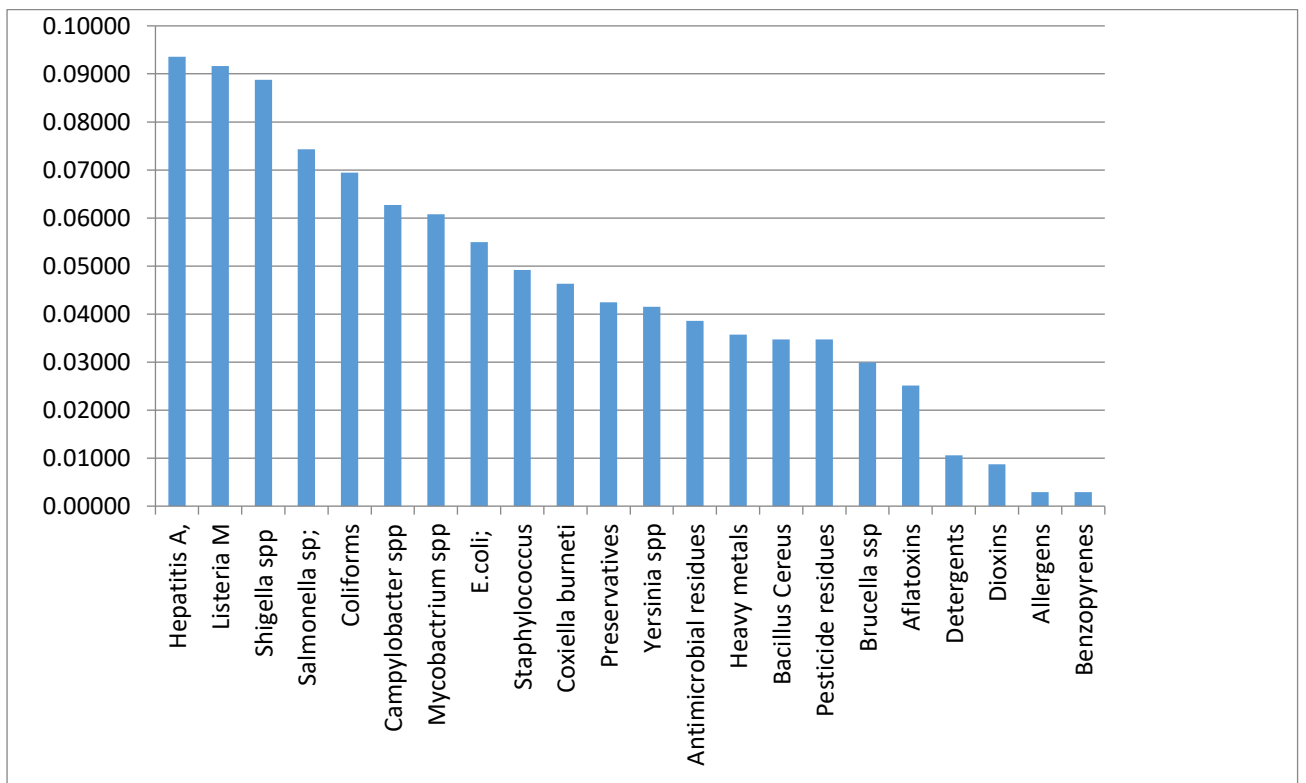


Figure 5: Prioritization of dairy food safety issues on their contribution to trade

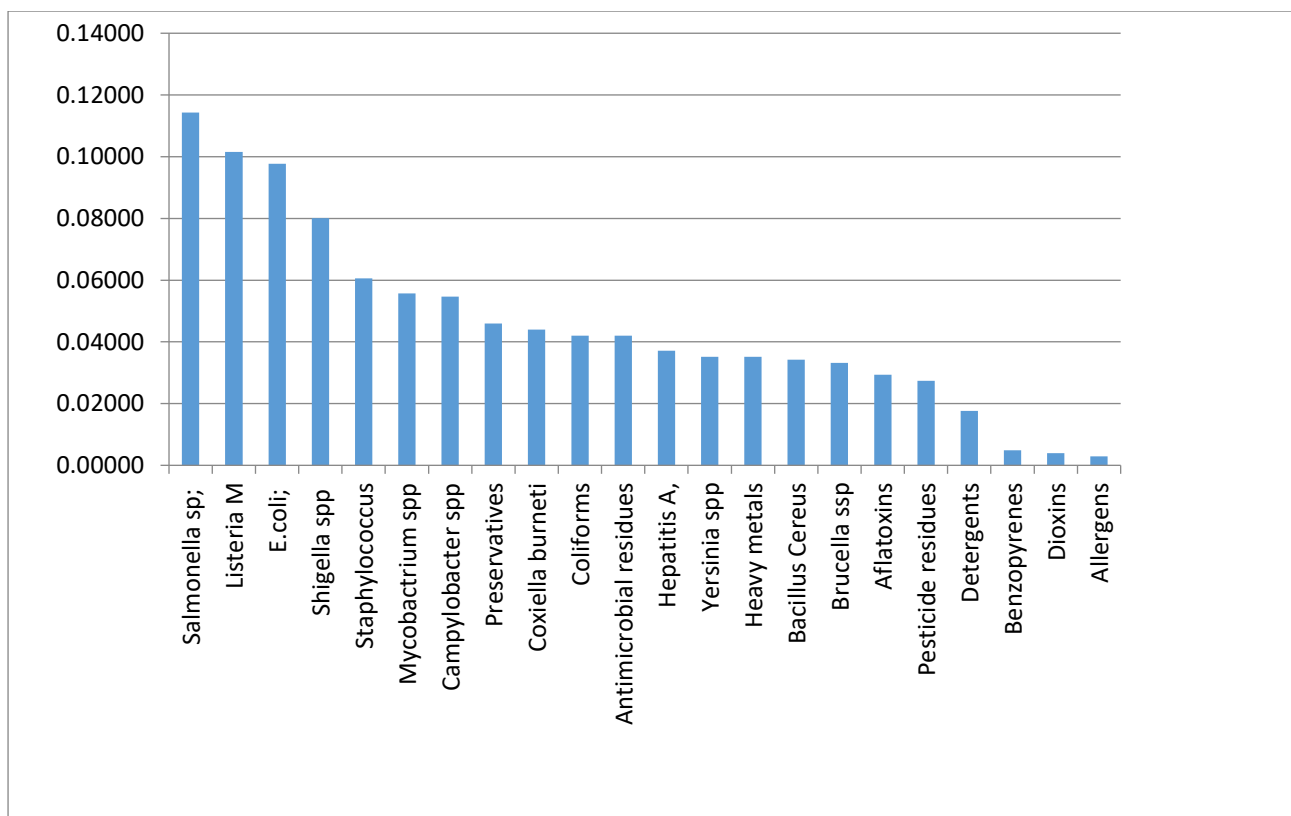


Figure 6. Prioritization of dairy food safety issues on their contribution to food loss

Observations

For both value chains, microbial hazards are important food safety issues. These microbial hazards are as a result of poor agricultural and hygiene practices while handling commodities (WHO, 1998). These are not only food safety concerns, but they contribute to food loss and contribute to trade loss opportunities. The key drivers of this scenario could be the inability of producers, traders and aggregators to individually guarantee suitable conditions along the commodity value chains, thus, pointing to the need for a public good approach or collective effort. Although chemical hazards could have been expected to feature more prominently as top priorities, the findings of this study do not support the assumption. This is probably because it is much easier for producers and handlers to comply with standards where these are well articulated. It is also likely that chemical hazards do not result in immediate/short term health impacts and were therefore not deemed as important as their biological counterparts.

These results echo the findings of the WHO (2015) on disease burden of foodborne illnesses where biological hazards caused about 349 million cases globally, *E.coli* 118 million; *Shigella* 51 million, Noro virus 124 Million, Hepatitis A 13 million cases and Non typhoidal *Salmonella* 78,000. The same hazards were found to contribute *E. coli* -245, non typhoidal *Salmonella* 338, *Campylobacter* 71, *Shigella* of the 889 DALYs due to bacteria food borne illness /100,000 population in the Sub-Saharan Africa.

Recommendations

To address these concerns requires capacity building of value chain actors on: - i) improvements in good agricultural practices at primary production, ii) hygienic handling practices and iii) regulators on enhanced enforcement of food safety standards. The above cannot be achieved without infrastructural (transportation and cooling facilities) development to enhance speedy delivery to markets with minimum cross contamination and spoilage. Such efforts would probably shift the priority issues away from biological hazards.

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Annexes

List of Participants

| Name | Gender | Organization | Email |
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| Caleb Atuya | Male | Kenya livestock producers association (KPLA) | caleb@klpakenya.org |
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Workshop Programme

Prioritization of Food Safety and Food Loss issues: Seasons Hotel, Elementaita, 2nd - 4th Oct. 2018

| Time | Activity | Facilitator |
|--|---|-----------------|
| Tuesday, 2nd October 2018 | | |
| 0800 | Arrival of Participants and Registration | |
| 0900 | Welcome | Joseph |
| 0915-0930 | Opening Remarks | ILRI |
| 0930- 1000 | Introductions | ILRI |
| 1000-1030 | Aims of the Workshop | ILRI |
| 1030-1045 | Tea Break | |
| 1045-1115 | Introduction to prioritization steps and definitions | Erastus |
| 1115-1215 | Agreement on List of issues | Samuel |
| 1215-1300 | Agreement on the Criteria definitions and Weighting of criteria | Samuel/Erastus |
| 1300-1400 | Lunch | |
| 1400-1500 | Weighting of Criteria | Erastus/Samuel |
| 1500-1700 | Reports from work groups | Erastus/ Samuel |
| 1700 | END DAY ONE | |
| Wednesday 3rd October 2108 | | |
| 0800 -1200 | Weighting Food safety against criteria | Erastus/Samuel |
| 1200 -1300 | Reports from work groups | Erastus/Samuel |
| 1300-1400 | Lunch | |
| 1400 - 1700 | Development of the summary Matrix | Erastus/ Samuel |
| Thursday, 4th October 2018 | | |
| 0900 - 1000 | Discussion on the outputs [prioritization Results] | Erastus /Samuel |
| 1000-1030 | Tea | |
| 1030 - 1230 | Discussion on the outputs [prioritization Results] | Erastus/Samuel |
| 1230-1330 | Lunch | |
| 1330-1400 | Comments from SNV | Gloria |
| 1400-1430 | Comments from Facilitators | Erastus |
| 1430-1500 | Comments from ILRI | Joseph |
| 1500 | CLOSING REMARKS | ILRI |