VOICE FOR CHANGE PARTNERSHIP (V4CP)

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Scoping Study: National Food Safety Architecture of the Dairy Value Chain, Kenya

Prepared for the Voice for Change Partnership (V4CP) by:
Erastus K. Kang'ethe, Samuel Muriuki, Joseph Karugia, Paul Guthiga and Leonard Kirui

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Abbreviations and acronyms

CAC	Codex Alimentarius Commission
COMESA	Common Market for Eastern and Southern Africa
EAC	East African Community
GDP	Gross domestic Product
HACCP	Hazard Analysis Critical Control Point
DPA	Dairy Processors Association
GHP	Good Hygienic Practices
KEBS	Kenya Bureau of Standards
NGO	Non- Governmental Organization
ReSAKSS	Regional Strategic Analysis and Knowledge Support System
SPS	Sanitary and Phytosanitary
WHO	World health Organization of United Nations
WTO	World Trade Organization

Executive summary

The dairy sector in Kenya is one of the largest and fastest growing subsectors in sub-Saharan Africa, producing about 5.2 billion litres of milk annually and contributing 6–8% of the national gross domestic product (GDP). The sector is dominated by smallholder producers who account for over 70% of the marketed milk.

This scoping study highlights food safety control situation issues to inform further steps towards improved food safety management and food loss concerns in the dairy value chain. An abridged questionnaire of the World Health Organization (WHO) guidelines for developing and implementing a national food safety policy and strategic plan was sent to a team of experts in the dairy value chain to provide the necessary information on the situation landscape.

The sector is regulated by several institutions and laws. It is served by several public and private sector laboratories capable of carrying out both microbial and chemical analysis. Many of these are concentrated in the major urban centres. With the efforts of the East African Community in harmonization of standards, the dairy sector has many harmonized standards covering raw milk and milk products.

The food safety issues raised by the expert team were mainly microbial and chemical hazards which were mainly due to failure to observe good agricultural and hygienic handling practices. The hazards contribute to food loss in the sector.

The institutions charged with food safety lack an overarching coordination mechanism to ensure effectiveness and efficiency in dealing with the food safety issues in the sector.

Introduction

The dairy industry is a significant agriculture sub-sector in Kenya. The country boasts the largest and most developed dairy sub-sector in sub-Saharan Africa, contributing about 6–8% to the national gross domestic product (GDP) (KAVES, 2015) and up to 30% to the agricultural GDP and household incomes and food security. This makes the sub-sector a key player in the country's economy (KNLP, 2008). Kenya's dairy sector is dominated by smallholder producers who constitute 70% of the gross marketed production (FAO, 2011) . The milk market is both formal and informal, with available data showing that the informal dairy market dominates. Of the total combined (camel, cow and goat) milk production (5.2 billion litres; FAO, 2016) only 20% is marketed through formal (licensed) channels or consumed at home. Most of the milk is marketed unprocessed through informal (unlicensed) channels. The informal milk market generates 70% of over 40,000 jobs in dairy marketing and processing. Dairy development in Kenya is primarily driven by the asset value (dairy cows) and growing consumer demand for fresh milk, and much less by public policies, interventions and investment decisions (Staal et al., 2008).

This study highlights the pertinent situational issues in an effort to open up the sub-sector for further steps towards improved organization and control of food safety and food loss concerns.

Food Safety

Food safety is a global public health concern whose importance is growing. Microbial pathogens and chemical contaminants in food represent serious threats to health. Emerging pathogens are becoming major food safety threats in areas where traditional hazards have been controlled. The World Health Organization (WHO) (2000) at its 53th World Health Assembly called upon Member States to give greater priority to food safety and urged them to become involved in a range of multi-sectoral and multi-disciplinary actions to promote the safety of food at all levels.

The dominance of informal markets and rural smallholder production models in Kenya's dairy sub-sector poses practical, structural and systemic challenges to the effective management of food safety and food loss in the dairy industry. This applies to both the enactment and enforcement of

food safety standards. This challenge is exacerbated by the seasonality of milk supply which peaks during the wet season when most rural roads are almost impassable.

Food loss

Food losses refer to the decrease in otherwise good edible food mass throughout production, post-harvest and processing stages in the food supply chain (Parfitt et al., 2010). In the dairy sector, loss is estimated globally at 20%, while in developing countries mastitis leads to 3–4% decrease in milk production.

Situation analysis

Situation analysis is a powerful tool that uses several methods to evaluate the internal and external environment of an issue to determine the state of play and identify options to change what is undesirable. In carrying out this situation analysis on food safety of Kenya's dairy sub-sector, the focus was on the food safety and loss control systems, mainly the institutional architecture and policy environment.

Purpose of engagement

This study is an engagement by the Regional Strategic Analysis and Knowledge Support System (ReSAKSS) of the International Food Policy Research Institute (IFPRI)/CGIAR to support civil society organization advocacy on food safety and food loss reduction policy with science-based evidence. This report therefore lends supports to the results of the prioritization of the food safety issues by a team of sector experts.

The terms of reference were to conduct a situation analysis of the prioritized food safety and food loss issues in Kenya.

Methodology

The situation analysis was conducted using a two-pronged approach. A detailed questionnaire was sent to 15 food safety experts in the dairy value chain identified by the civil society organizations, ReSAKSS and the consultant, with a request to respond and return the filled questionnaire before a scheduled prioritization workshop. The questionnaire format was an adaptation of the WHO tool

for conducting assessments of national food safety programmes (WHO, 2012). The questionnaire sought information on institutional architecture; policy environment; hygiene practices; regulations and standards; harmonization with international standards; inspection; extension and advisory services; food control laboratories; causes of food safety and food loss concerns; food safety at primary production and processing; food loss reduction; and the engagement of stakeholders across the board. The questionnaire was supplemented with a desk review of literature.

Results

Institutional architecture

Responsibility for food safety control is shared among the different government ministries and agencies. The main institutions and their sources of mandate are listed in Table 1.

Table 1: Key food safety institutions for the dairy sub-sector in Kenya

Institution	Nature	Source of authority/mandate*	Responsibility/scope
Kenya Agricultural and Livestock Research Organization (KALRO)	Statutory research organization	Kenya Agricultural and Livestock Research Act 17 of 2013	Promote research in crops and livestock, crop and livestock diseases, formulate and make policy recommendations on agricultural research amongst other functions
Ministry of Agriculture, Livestock and fisheries [MoALF]	Coordination and policy development at national level	Constitution—Executive arm	Coordinate agriculture, livestock and fisheries activities and policies
Ministry of Health, Department of Public Health	Statutory	Public Health Act, Cap 242 Food Drug and Chemical Substance Act 254	Responsible for all food safety aspects of marketed food products Inspection to prohibit sale of unwholesome foods
Ministry of Industry and Trade	Statutory	Consumer Protection Act, No. 46 of 2012	Advice the government on consumer protection, policy formulation, coordination of consumer activities and rights
County governments	Coordination and facilitation county level	Constitutional—County Governments Act 17 of 2012	Responsible for any function as stipulated by Act of Parliament or Constitution
Kenya Bureau of Standards (KEBS)	Statutory	Established under the Standards Act, Cap 496	Coordinates the development of standards, codes of practice and testing facilities for local, export and import goods

Kenya Dairy Board	Statutory	Established under Dairy Industry Act, CAP 336	Organize, regulate and develop the efficient production, marketing, distribution and supply of various dairy products, promote quality, private enterprise, research and development and adoption of measures and practices for greater efficiency in the industry
Kenya Dairy Traders Association (KDTA)	Private	Established by small-scale milk traders	Empower both farmers and traders to lobby for needed policy changes
Kenya Dairy Processors Association (KDPA)	Private		KDPA is a forum for the development and promotion of a professionally managed dairy industry in Kenya
Kenya Dairy Farmers Federation (KDFF)	Private	Formally established and registered in February 2012 as a farmer organization	Advocacy drive, expand and organize the dairy industry in Kenya to become efficient, competitive and sustainable
Eastern and Southern Africa Dairy Association (ESADA)	Private membership organization	Established in 2004, with an overall mandate of increasing trade in African dairy products	Promote and advocate for efficiency and effectiveness towards achieving quality standards in Africa's dairy sector through innovative technologies and knowledge sharing, focused on market developments, capacity building while caring for customers' social and environmental responsiveness.

*Source: Kenya law review

The functions of these institutions include sensitization, inspections and implementation of codes of hygiene and agricultural practices by stakeholders throughout the food chain.

Notably, there is no overarching food safety institution. However, a multi-sectoral National Food Safety Coordination Committee (NFSCC) has been initiated by various government agencies/institutions who are players in the food chain with the objective of coordinating all food safety activities in the country. NFSCC is expected to evolve into a permanent institutional structure on food safety.

Policy environment

Kenya has no overarching food safety law or institution. However, some respondents indicated that the national food security and nutrition policy provides an overarching framework for food security, nutrition and safety. Food safety of milk and milk products is governed by multiple policies and legal frameworks vested in different institutions and ministries (Table 2).

Table 2: Policy and legal frameworks governing the safety of milk and other dairy products in Kenya

Policy/legal framework	Responsible institution	Nature of responsibility
The Constitution of Kenya, 2010	The Executive	Assure freedom from hunger, and to have adequate food of acceptable quality
	Ministry of Agriculture, Livestock and Fisheries	Coordinate agriculture, livestock and fisheries activities and policies
The Dairy Industry Act, Cap 336	Kenya Dairy Board (KDB)	Improvement and control of the dairy industry and its products
The Public Health Act, Cap 242	Department of Public Health, Ministry of Health	Securing and maintaining public health
The Standards Act, Cap 496	Kenya Bureau of Standards (KEBS)	Promote the standardization of the specification of commodities and provide for the standardization of commodities and codes of practice
The National Livestock Policy, 2008	Ministry of Agriculture, Fisheries and Livestock Development	Create a conducive policy environment to facilitate enhanced and sustainable growth of the livestock sub-sector
The National Food And Nutrition Security Policy, 2011	Ministry of Agriculture, Fisheries and Livestock Development	Provides an overarching framework for food and nutrition security, the synergy with poverty eradication and priority interventions to ensure all citizens' right and access to sufficient safe food
The Food Security Act, 20l4	Ministry of Agriculture, Fisheries and Livestock Development	Gives effect to articles of the Constitution on the freedom from hunger and the right to adequate food of acceptable quality
The Animal Diseases Act, Cap 364	State Department of Livestock	Provides for matters relating to the management of diseases of animals, including notifiable diseases

The Kenya Veterinary Policy, 2015	State Department of Livestock	Provides a framework for safeguarding animal propagation, health and welfare for food security and economic development, and human well-being
The County Governments Act, 2012	The Executive	Responsible for agriculture and health and other devolved functions as stipulated by Act of Parliament or Constitution
The Veterinary Medicines Directorate Regulations, 2015	State Department of Livestock	Formulate and enforce quality assurance standards in the in the manufacture, distribution and use of veterinary medicines to safeguard human and animal health and the environment
Kenya Agriculture Livestock Research Organization (KALRO) Act 17, 2013	Provides for the establishment and functions of KALRO	Research in crop and livestock, crop and livestock diseases, formulate and make policy recommendations on agricultural research amongst other functions
Food and Drugs and chemical substance Act, Cap 254	Ministry of Health-Public Health	Covers the sale of unwholesome , poisonous, adulterated and poor quality food, preparation of food in unsanitary conditions, adulteration of chemical substances, mislabelling and packaging

There are reportedly some ongoing initiatives towards establishment of an overarching mechanism on food safety. This includes the drafting of a National Food Safety Policy (2013) which is under discussion. It is intended to establish an integrated farm-to-fork food safety system, harmonize and consolidate inter-agency efforts and ensure protection of public safety and food trade in line World Trade Organization/Sanitary and Phytosanitary (WTO/SPS) and other international requirements. The draft policy seeks to address food safety legislation, institutional framework, monitoring and evaluation, traceability, resources, information, education and communication. It also seeks to establish a National Food Safety Authority to facilitate the orderly development food industries, fair trade, promote human health, conduct risk analyses, coordinate food control infrastructure and facilitate the fulfilment of international obligations.

Regulations, Standards and Codes of hygienic practices

Kenya has regulations and standards on food safety for the dairy industry but not on food loss reduction. Only the Kenya Bureau of Standards (KEBS) has the mandate to make the standards that apply nationally and usually involves stakeholders through standards development committees. The Kenya Dairy Board often develops regulations and guidelines for the industry, besides chairing the dairy standards committee at KEBS. The standards and regulations cover all aspects of milk hygiene, including milking, post-harvest handling, transportation, distribution, drink and manufacturing industries, milk carriers and storage.

In drafting the standards, KEBS considers the international standards and recommendations such as WTO and the Codex Alimentarius Commission (CAC). Other authorities that make rules and regulations regarding the safety of foods, including dairy, are the Public Health Department and the Directorate of Veterinary Services.

Harmonization of Standards

Kenya is a member of several regional and international organizations which have interests in food safety and standard setting. These include CAC, the East African Community (EAC), the Common Market for Eastern and Southern Africa (COMESA) and WTO. KEBS is the national WTO entry point and CAC focal point with a functional codex committee and secretariat. Through KEBS, the country works with stakeholders to harmonize its standards with the external agencies. Notable

examples of these include the EAC-SPS protocol, the COMESA-SPS protocol and the EAC-COMESA-Southern Africa Development Cooperation (SADC) tripartite agreement. From the responses received, it was unclear whether policies and legal frameworks of the different national institutions involved in food safety are harmonized. However, under the EAC protocol on free movement of goods and services several dairy standards have been harmonized (EAC, 2007).

Inspection

All the key institutions involved in the safety of milk and milk products also play active roles in inspectorate services. KEBS, the Ministry of Health (Public Health Directorate), the Kenya Dairy Board (KDB) and the Directorate of Veterinary Services conduct regular inspections as mandated by the relevant laws.

The main focus of inspections are product handling at primary production, premises, carriers and transporters, containers, licenses, personnel, and construction designs, equipment and packaging.

Table 3: Inspection coverage details in the dairy value chain

Category	What is checked?
Primary production	Good agricultural practices
Premises	Construction, equipment, environmental hygiene (water, waste disposal, vermin control)
Personnel	Personal hygiene, health certificate
Process	Adherence to HACCP or other standards
Packaging	Quality of material, labelling
Transportation	Vehicle hygiene, cold chain maintenance, containers

Food Control laboratories

Food control laboratories are an essential component of a national food safety control system. Several public and private laboratories serve the dairy sub-sector. These include KEBS, the Kenya Medical Research Institute (KEMRI)/Government Chemist, the Kenya Agricultural and Livestock Research Organization (KALRO), the National Public Health Laboratories and laboratories in public universities. Other laboratories are private—Société Générale de Surveillance (SGS), Analab, and Prolab, Agriqest, boratech, and major milling companies like Unga, Pembe and Mombasa millers have food control laboratories.

The laboratories collectively have the capacity to carry out both microbiological and chemical analysis. Despite the fact that most of these laboratories are not accredited, they regularly participate in proficiency testing programmes. On average, the experts estimated the turnaround of results to be between 1 and 2 weeks depending on the test.

Advisory services and consumer awareness

The main service providers of information regarding food safety are government departments, industry (such as cooperatives, processors and associations, non-governmental organizations (NGOs)) and individual consultants. The main difference between these service providers is the type of message they deliver to farmers, transporters, processors, retailers and consumers. While the government message to all the recipients is basically on safety and compliance, industry's message is basically product promotion, nutrition. Rarely does the industry relay messages on safety although these are printed on the labels. NGOs, which are mainly consumer organizations or development agencies, have more targeted messages on food safety, production and loss. Table 4 shows the expert opinion on who the target of the message delivered by various service providers in the sector.

Table 4: Advisory and extension messages targets by services providers

Recipient	Service providers			
	Government departments (national/county)	Industry	NGOs	Consultants
Farmers	✓	✓	✓	✓
Transporters	✓	✓	✓	✓
Processors	✓	✓	✓	✓
Retailers	✓	✓	✓	✓
Consumers	✓	✓	✓	✓

The industry lacks a mechanism for registering grievances and flagging food safety loss issues. While this could be considered on setting up an apical mechanism/policy on food safety, the food safety department in the Directorate of Public Health in the Ministry of Health could provide such, though it is not mandated by the current law.

The Key Food Safety Concerns and Stakeholder engagement

The main food safety/loss concerns highlighted by the respondents were foodborne illnesses due to biological agents and chemical contaminants. Bacterial pathogens were the leading cause of concern, followed by viruses and to a lesser extent toxins and antimicrobial residues.

The specific causes of food safety issues were microbial: (*Salmonella* spp, *Listeria monocytogenes*, *Escherichia coli*, Hepatitis A, *Shigella* spp, *Campylobacter* spp, *Staphylococcus* spp, coliforms, *Mycobacteria* spp, *Bacillus cereus*, *Coxiella burnet*, preservatives, *Brucella* spp., *Yersinia enterocolitica*, antimicrobial contaminants, heavy metals, pesticide/acaricide residues, aflatoxins, detergents, dioxins (additives) allergens and benzopyrenes in order of importance. Other key concerns for the dairy sector players were spoilage, weak systems and enforcement of standards, and lack of awareness of food safety issues by consumers. Poor rural roads and lack of a consistent food safety monitoring programme were also cited. Respondents reported that dairy stakeholders had weak organization and lack an effective forum to represent their agenda. It was, however, evident that food safety/loss control institutions make concrete efforts to involve dairy stakeholders. The engagement is, however, ad hoc and often in response to a problem.

Food safety in primary production and manufacturing or processing

About 70% of Kenya's milk is produced by smallholder farmers mostly operating in rural areas (FAO, 2011). This arrangement has implications for the safety and handling of fresh milk. Kenya has over 30 licensed milk processors but the dominant 2 (New Kenya Cooperative Creameries (KCC) and Brookside dairies) hold over 60% of the processing capacity.

Smallholder production has challenges with infrastructure (cow sheds), equipment, knowledge and skills (food safety, husbandry and hygiene), access to professional services (veterinarians, extension workers etc.), financial services, access to markets etc. Thus, issues such poor infrastructure (roads, power and water), mastitis, poor hygiene, lack of cold chain, glut/overproduction, adulteration, and delayed collection, wrong containers, use of inappropriate containers and lack of access to professional services are among the constraints to effective food safety controls at primary production. Other malpractices such as wilful addition of preservatives (hydrogen peroxide and antibiotics) to extend milk shelf-life, contaminants from the environment (dioxins, parasites, heavy metals and waterborne hazards (coliforms)), inappropriate treatments

dirty containers (detergents and biological) further compromise milk safety and quality at primary production.

Food safety issues at processor level would reflect the pooled effect of unsafe milk where quality assurance and testing are not done properly. These would be minimized with proper testing and controls at reception. Building more collaborative relationships between primary producers and processors would also ensure better milk quality and safety. Both parties would share information, best practice and support systems to entrench mutually beneficial practices. Processors and primary producers lack such mutualism. Their relationship is characterized by mistrust, exploitative practices, lack of cooperation, poor coordination, more emphasis on quantity vs quality, lack of consensus on quality issues, no investment on capacity building and quality, no pressure/incentive to deliver quality, among others. A similar scenario exists between processors and transporters, pigeonholed as lack of loyalty, late payments, leased transportation, no training for retailers/transporters, and no responsibility for managing losses.

These weaknesses notwithstanding, processing firms have the capacity to handle milk safely. The firms are implementing Good Manufacturing, Hygienic Practices guidelines [GMP and GHP] while some are applying the Hazard Analysis Critical Control Point (HACCP) system.

The manufacturing firms have little or limited association with regulatory agencies on food safety and loss issues. The one that exists is during inspection and collection of levies and taxes. The main concern of food manufacturing firms regarding the national food control system is the lack of enforcement of legislation and low level of compliance among primary producers and small-scale traders. Those that are effectively implementing HACCP and other voluntary standards are concerned about the high cost of compliance without any incentives from government to encourage compliance.

The manufacturing firms have weak relationships with primary production except in cases where they have collection centres and they are obliged to provide extension services and technical support to assure quality of collected milk.

Food Loss

Food loss is the proportion of decrease of otherwise good food produced before it is consumed. This could be due to decreases in quantity or quality reflected in nutritional value, economic value

or food safety that is produced but is lost between harvesting and retail and is therefore not eaten. There are generally no mechanisms for estimating, monitoring or controlling food loss in the dairy sub-sector.

On average, experts estimated the food loss associated with food safety concerns in the dairy sub-sector to be between 6% and 10%. The hazards responsible for food safety concerns were responsible, except they manifested different levels of impact. Although *Salmonella* spp, *Listeria monocytogenes* and *E. coli* were equally important for both food safety and food loss, *Mycobacteria* spp, *Staphylococcus* spp, antimicrobial residues and preservatives assumed a greater importance for food loss.

Other main causes of food loss were enumerated as overproduction and adulteration resulting in rejections, contamination, poor handling practices, poor infrastructure, overproduction, lack of cold chain and delayed/failure of collection and pest and diseases. The main impacts of food loss are loss of income to the producers and reduction of available food resulting in food insecurity. The state of food loss in the dairy sub-sector is quite dire, considering that no mechanism exists for its mitigation. The need to develop a policy framework to monitor and mitigate food loss is therefore urgent.

Observations

The dairy subsector is a vital sector providing employment, income, nutrition and food security. The sector has many challenges and addressing these would propel the subsector higher in contributing the economy of Kenya. The following are the gaps identified that require solutions to improve milk safety.

i) The food safety issues affecting the dairy sub-sector seem to stem from a mix of causes. The biological hazards could originate from contamination of the milk during harvesting or post-harvest handling, udder infections by mastitis agents or use of non-potable water for cleaning milk containers. The chemical agents such as preservatives could reflect wilful addition to extend the shelf life of milk while detergents may be an indication of improper cleaning of milk containers. The antibiotic residues could indicate non-observance of minimum withdrawal period after treatment or other forms improper application of antimicrobials.

ii) The food control institutional architecture in Kenya is inadequate for effective and efficient delivery of food safety services. The many players charged with the responsibility are disjointed, uncoordinated and poorly governed. The situation of the dairy sector is especially wanting considering the predominance of smallholder production and informal milk marketing. With the existing gaps in food safety controls, this leaves most local consumers who depend on the informal traders for their milk supply exposed to foodborne hazards. The formal and export market segments of the dairy industry bear less risk because processed milk and milk products are subjected to fairly rigorous and well-controlled safety standards. It is therefore necessary to put mechanisms in place to enhance the institutional and policy environment for food safety.

iii) The institutions charged with food safety mandates have legal mandates but lack an overarching coordination mechanism and unified policy framework to guarantee effectiveness and efficiency in discharge of their mandates.

iv) The sector is served by several food control laboratories (public and private) which are located in large urban centres. Consequently, their services are not easily accessible to smallholder farmers who produce the bulk of the milk serving the domestic market and which may be a foodborne illness risk.

v) Microbial contamination due to poor hygienic handling (poor adoption of good agricultural practices) is the food safety concern of the domestic market while pesticide residues in excess of the maximum residue limit is the major concern of the export market.

vi) The relationship between producers and processors is weak, and imbalanced. This link needs strengthening so farmers can receive feedback on market quality demands so that they can improve quality and reduce incidence of market trade rejections. This approach is particularly important for the key regulators, to ensure the smallholder producers and traders who form the bulk of the sector capital, are empowered and effectively mobilized for inclusive participation in the growth of the sector.

vii) For the dairy sub-sector to attain optimal performance, purposeful strategic investment by the government or in partnership with the private sector is needed to organize the

smallholders in a manner that builds economies of scale through pooling and creates a common vision for improved quality milk.

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