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Food Safety and Food Security in the Informal Sector

Bukelwa Grwambi

Abstract

Food markets in the informal sector play a vital role in the livelihoods of the poor in developing countries. However, the conditions under which the informal sector operates raise concerns relating to the safety and quality of food sold. This chapter makes reference to case studies conducted by the International Livestock Research Institute's Safe Food Fair Food project to facilitate the implementation of food safety in Sub-Saharan Africa. The purpose is to illustrate the relevance and applicability of a food chain approach in the implementation of food safety in the informal sector. Results show that some milk gets contaminated during milking, processing, cooling and handling. Such practices as adulteration and pooling were also reported to contaminate milk. The chapter concludes that it is the responsibility of all stakeholders to ensure the safety of milk along the chain.

Keywords: foodborne illnesses, food chain, milk, contamination

1. Introduction

Informal economies have long been the linchpin of food security for both the rural and urban poor in developing countries [1]. The most visible activities in the informal sector are food production (urban, peri-urban and rural), processing, catering and transport and retail sale of fresh or prepared products (e.g. street food) with women being responsible for small catering operations and street food sales [2]. Women are traditionally skilled in these activities and already have the necessary cooking utensils at home, while the food they prepare also enables them to feed their families [3].

Most of the eggs, fish, meat and milk sold to the poor in urban Africa are sourced from informal markets [4]. For example, in countries like Kenya, Mali and Uganda, 80–90% of raw milk is purchased from vendors or small-scale retailers in informal markets [4]. Informal markets in this regard contribute to food security and do so in various ways. First, informal markets tend to be located closer to low-income housing settlements and thus serve as the main source of food for many of the urban poor [1]. Second, informal vendors can sell in smaller quantities, at lower prices and on credit, thus making food affordable to marginalised consumers [2, 5]. Third, the many points of sale near schools and offices, bus stops and stations facilitate access to food, thus saving consumers' time and transport costs [2]. Fourth, the ability of poorer households to produce their own food products especially in situations of economic uncertainty can be crucial for food security [2].

Despite this contribution to food security, the safety of food sold in the informal sector has been raised as a matter of concern. Traders in informal markets operate in settings without electricity, clean potable water, waste disposal and sanitation facilities [4, 5]. These settings are sometimes dusty and muddy and/or may sometimes be flooded due to poor roads [6]. Such an environment exposes food to contamination, thus increasing the risk of foodborne illnesses [6].

The implementation of food safety in the informal sector has traditionally focused on enforcement mechanisms to remove “unsafe” food from the market [3, 7]. This reactive approach which is also a response to other non-compliances of the sector such as tax evasion, trespassing on private land and traffic congestion mainly targets street vendors and typically involves issuing of fines, making of arrests, confiscation of merchandise and demolishing of market stalls [7].

The sole focus of these campaigns on street vendors in the drive towards implementation of food safety in the informal sector somehow fails to hold producers (including urban and peri-urban agriculturalists), transporters, processors (including home-based caterers), managers, small restaurant owners, members of cooperatives etc. accountable as these stakeholders also have a role to play in ensuring the production, processing, packaging and distribution of safe food along the food chain. As a result, such campaigns have been rendered ineffective (see, e.g. [1, 4]).

This chapter makes reference to case studies conducted by the International Livestock Research Institute’s Safe Food Fair Food project to facilitate the implementation of food safety in Sub-Saharan Africa. The purpose is to illustrate the relevance and the applicability of a food chain approach in the implementation of food safety in the informal sector. The chapter is organised as follows. Section 2 presents a theoretical framework with the first sub-section outlining the food chain approach in the implementation of food safety followed by foodborne illnesses and their impact on public health. The methodology section follows after which we present the results. The chapter then draws conclusions and outlines implications for stakeholders concerned and some recommendations for further research.

2. Theoretical framework

2.1 The food chain approach in the implementation of food safety

For food to be regarded as safe, there should be assurance that it will not cause harm to the consumer when prepared and/or eaten according to its intended use [8].

The food chain approach acknowledges that the responsibility to provide safe, healthy and nutritious food lies with all the actors taking part in the production, processing, trade and consumption of food along the entire food chain from primary production to final consumption [3]. Chain actors include food producers, fishermen, abattoir operators, food processors and distributors including wholesalers and retailers. This responsibility extends to the end-consumer who must be educated to ensure that food is properly stored and hygienically prepared and food shelf lives are respected [3]. Government departments with a mandate to render public health services are also implicated in this regard [3].

The food chain approach uses a scientific, rational and systematic approach known as the Hazard Analysis and Critical Control Points (HACCP) to identify, assess and control hazards during production, processing, manufacturing and preparation of food. For HACCP to be effective, a strong foundation of safety-related prerequisites is essential.

Prerequisite programmes include, among others, the implementation of good manufacturing practices, good agricultural practices, good hygiene practices,

sanitation, standard operating procedures, employee hygiene and training, product labelling and coding, facilities design, equipment calibration and maintenance. Food safety along the value chain thus promotes the adoption of conditions and practices that preserve the quality of food in order to prevent contamination and the resulting foodborne illnesses [8].

2.2 Food contamination and foodborne illnesses

Foodborne illnesses are diseases caused by microbiological, chemical and physical agents that enter the body through the ingestion of contaminated food and/or water used for its production, processing and preparation [2, 3, 9]. In humans, foodborne illnesses are linked to more than 250 different types of viruses, bacteria, parasites, toxins, metals and prions [10] and are usually either infectious or toxic in nature. They are at best unpleasant and at worst fatal.

The infections range from mild gastro-enteritis to life-threatening neurological, hepatic and renal syndromes caused by either toxin from the disease-causing microbes or by the human body's reaction to the microbe itself [11]. Although viruses are more responsible for more than 50% of all foodborne illnesses, generally hospitalizations and deaths associated with foodborne infections are due to bacterial agents [11]. Of the many thousands different bacterial species, more than 90% of food poisoning illnesses are caused by species of *Staphylococcus*, *Salmonella*, *Clostridium*, *Campylobacter*, *Listeria*, *Vibrio*, *Bacillus* and *Enteropathogenic coli* [12]. Around 2 million people die every year from diarrhoeal diseases largely due to contaminated food and water [2, 3].

The contamination of food may occur at any stage in the process from production to consumption (farm to fork or stable to table) and can also result from environmental contamination including pollution of water, soil or feeds [2, 3]. Improving the safety and quality of food at all stages of the food chain is therefore important in reducing the risks associated with the consumption of contaminated food and the resulting foodborne illnesses.

3. Methodology

3.1 Choice of the study area

For over a decade, the International Livestock Research Centre (ILRI) and partners have been conducting research on food safety in informal markets in Sub-Saharan Africa. The objective is to support intensification of livestock production by building capacity for better management of safety of animal source food products. The ultimate goal is to maximise market access for the poor dependent on livestock and livestock products while minimising foodborne illnesses for poor consumers [13]. While the focus of ILRI's Safe Food Fair Food project was livestock and livestock products, the majority of the cases studied milk in informal markets. This chapter therefore focuses on informal milk marketing in Sub-Saharan Africa.

3.2 Context of the study

Milk produced in the informal sector often leaves the farm gate through three channels, namely, collectors who sell the milk to the informal market, sale to the dairy cooperative and/or sale within the community [14]. Collection of milk is carried out at milk collection centres by dairy cooperatives or private milk collectors [14, 15]. Milk producers and other traders transport their milk on foot, by horse and

by donkey and/or make use of a private milk transporter to deliver the milk to the milk collection centres and to the processing plant [14].

Alternatively, milk producers take their raw milk to the milk collection points. From the milk collection points, the milk is transported to a dairy plant or to the milk collection centres where it is bulked, cooled and transported to the dairy plant. Private milk collectors and dairy cooperatives operate milk collection points and milk collection centres [14]. The dairy cooperatives are mainly involved in bulk collecting of raw milk from the members in order to process the collected milk into different dairy products [14]. Informal milk marketing thus involves direct supply of fresh raw milk by small-holder dairy producers to the neighbouring final consumers and to the traders or individuals in the nearby cities.

3.3 Data collection

This chapter makes reference to case studies conducted by the International Livestock Research Institute under the Safe Food Fair Food project in Sub-Saharan Africa. Secondary data sources of information are also consulted to complement the data.

3.4 Data analysis

This chapter applies guidelines on good agricultural practices, good manufacturing practices and good hygiene practices to offer justification as to why it is important to adopt a food chain approach in the implementation of food safety initiatives in the informal sector. The chapter does so by making reference to the case studies on milk production in Sub-Saharan Africa by the International Livestock Research Institute under the Safe Food Fair Food project.

4. Food safety along the milk value chain in the informal sector

Like any other food business, milk producers must aim to ensure that the safety and quality of the raw milk produced will satisfy the highest expectations of the food industry and consumers [16].

4.1 Good agricultural practices

Good farming practices underpin the marketing of safe, quality-assured milk-based products [16]. This means that on-farm practices should ensure that milk is produced by healthy animals under acceptable conditions for the animals [16]. The focus of on-farm practices should be on preventing a problem (including animal diseases) rather than solving it after it has occurred [16]. However, according to Desissa et al. [17], 92% of dairy farmers indicated that their cows had recently experienced inflammation of the udder. Kilango et al. [18] also reported that almost 90% of the farmers had encountered udder infections in their animals. Only 21% of the farmers were reported to have used post-milking teat disinfectant which is known to be effective in preventing udder inflammation [18].

Milk producers are required to manage the use of all chemicals, e.g. detergents, disinfectants, antiparasitics, antibiotics, herbicides, pesticides and fungicides, to prevent unacceptable chemical residues occurring in the milk and unsuitable chemicals adversely affecting animal health and productivity and are expected to be aware of all chemicals that may leave residues in milk [16]. Milk producers are also required to observe withholding periods, i.e. the minimum times when milk

should not be sold for human consumption after application of chemicals [16]. Interestingly, most of the farmers knew about the proper use of antibiotics to treat dairy cows and the importance of adhering to the withdrawal period for milk from cows undergoing treatment [18]. Yet in a study done by Kouame-Sina et al. [19], almost a quarter (24.7%) of the milk samples contained antibiotics.

Milking is the most important single activity in a dairy farm [16]. FAO [16] recommends that before a cow is milked, the foremilk should be extracted and checked for abnormalities. It is also expected of farmers to follow appropriate procedures to separate milk from sick animals and animals under treatment. For example, sick animals could be milked last into a separate container and/or separate facilities may be provided if possible [16]. However, Kouame-Sina et al. [19] reported that milk from cows with udder inflammation (mastitis) was still sold.

Yobouet et al. [20] and Kone et al. [21] also observed that while milking, milkers often dipped their fingers into the milk to use it as a lubricant to help them milk faster. The farmers considered it necessary to grease the teats with milk. However, this practice presented a risk of milk contamination [21].

FAO [16] recommends that the disposal of diseased and dead animals should be done in a way that minimizes the risk of disease spread. According to Sow et al. [22], about 12% of farmers reported their cows had aborted once, and approximately 2% reported that their cows aborted twice, while 27% reported their female goats had aborted once, 4% twice and 1% thrice. Almost 75% of these respondents reported they handled the aborted material of their goats; for instance, they would handle the foetus with bare hands and later burn it [22]. While the latter practice reduces the risk of transmission of brucellosis, touching the aborted material with bare hands makes transmission very likely [22].

4.2 Good manufacturing practices

Good milk is considered to be cow milk that is not mixed with that from other species or milk powder [21] or any additives or adulterants. However, it was found out that producers sometimes put additives in milk to increase fat content. They also add water in milk to increase volumes. This practice, which is commonly known as adulteration, is done in an attempt to get fair and remunerative prices for the milk. In the dairy industry in West and East Africa, it seemed to be common practice to add water to milk in order to sell large quantities. Yobouet et al. [20] also observed that adulteration of milk by adding water was relatively widespread among retailers, with 47.1% of them reportedly adding water to the milk before selling it.

Similarly, in a case study by Kouame-Sina et al. [19], 50% of the milk on sale was adulterated with water. Adulteration of milk is not only illegal but also presents a health risk to consumers if the added water is contaminated [20]. With adulteration, consumers get less of what they paid for [21]. This practice is also unethical. According to Desissa et al. [17], collection centres checked the milk for adulteration with water and contamination with hair, hay or faeces. Milk that does not pass the quality test is rejected and is mostly processed by the women into féné (partially fermented milk), which may present a health risk [21]. More than 25% of the vendors did not use any form of quality control checks before buying the milk [18] which meant that they could not establish whether the milk they bought was contaminated or not.

Because of its high perishability, holding milk for long periods without cooling it can lead to rapid growth and multiplication of the milk bacteria [18]. To sustain quality, milk is generally cooled after harvesting.

To cool the milk, some producers predominantly used package icing. The ice blocks are purchased from vendors who make them by filling polythene pouches

with tap water and packing the pouches in a freezer [23]. While water and ice cooling methods provide fast initial cooling, they also feature the highest risk of contamination.

In the cases studied by Spengler et al. [24], none of the farmers in the study sites cooled the raw milk. The traders and retailers also reported that the milk they received from the farms was not cooled [20].

Pooling of milk was also reported to increase the risk of contamination. Yobouet et al. [20] reported that upon receipt of milk from farmers, traders and retailers bulked the milk in a single storage tank. This is risky because, if the milk from one supplier is contaminated, then there is a higher chance that the entire batch in the tank will be spoiled. According to Desissa et al. [17], only milk from cooperative members was purchased and pooled into a 50 litre container.

With regard to packaging, all of the vendors used plastic buckets for handling the milk, a practice that is not recommended as plastic containers are known to be vulnerable to bacterial contamination due to difficulty to sterilise [18]. This was also observed by [23].

4.3 Good hygiene practices

Workers can unintentionally contaminate milk, water supplies and equipment, thus transmitting diseases to other workers or consumers. Proper hand-washing, correct washing procedures including applying soap on wet hands, scrubbing of whole hand during a minimum of 20 s, rinsing with water, drying with paper towel (disposable) and turning off the knob with towel are recommended as part of enhancing food safety [8].

It was interesting to observe that at least some of the recommended hygiene practices were followed. However, some of the procedures applied were not completely correct which could further contaminate the milk. For example, milkers cleaned the udders of the cows either with dry hands or with water that was not of potable quality [24]. Yobouet et al. [20] and Kouame-Sina et al. [19] both observed that prior to milking, most milkers washed neither their hands nor the udders of the cows, while in other cases, the majority of the farmers washed their hands before milking [25]. Kabui et al. [25] also observed that the majority of those who washed their hands used water and soap [25], while in a case study by Kilango et al. [18], only 17% of milkers washed their hands with water and soap. Farmers only cleaned their hands with cold water from a contaminated water source [24].

Almost all milkers washed the cow udders before milking. However, most of the milkers did not dry their hands or the udders of the cows, thus increasing the risk of contamination from dirty water running into the milk [18].

Using one cloth for each cow to dry the udder is recommended as it prevents the transfer of bacteria and dirt from one animal to another. Kilango et al. [18] observed fewer milkers used one cloth per cow to dry the udder, and according to these authors, using a shared cloth for several cows may be worse than using no cloth at all [18].

Proper personal hygiene is also important to enhance food safety in informal milk markets. Regular bathing or showering, washing of hands and keeping nails clean and short and wearing of clean clothes and hair nets are thus recommended. According to Kilango et al. [18], only 59% of the staff working at milk kiosks wore clothes that were visibly clean.

Proper cleaning of milk utensils is also instrumental in the implementation of food safety in informal milk markets. About 82% of the staff used soap for washing utensils [18]. Those without basins but with running hot water cleaned the milk

handling equipment in the same bowl used for washing hands [18]. This practice is not good as it may increase the risk of contamination.

5. Conclusions and recommendations

While vendors are at the forefront of milk sales in informal markets, the informal market environment seemed not to be the only source where food can get contaminated as is always perceived. Results show that some milk got contaminated during milking, cooling, pooling, processing, packaging, handling and cleaning of milking utensils which means that other stakeholders who handled the product were also responsible for milk contamination but were not held accountable for supplying a product that is “unsafe” as perceived by the authorities. Ensuring food safety along the chain therefore becomes the responsibility of everyone who has a role to play. The fact that a high number of incidents of foodborne illnesses is recorded in informal economies is also enough evidence to warrant the implementation of food safety practices in informal economies but a correct approach and strategies need to be adopted. Compliance of relevant actors with food safety principles should therefore be encouraged.

6. Implications for stakeholders along the milk value chain

These findings have implications for dairy farmers/milk producers, milkers, retailers/milk kiosks operators, milk cooperative members, processors, traders/vendors, households and consumers of milk. These stakeholders all need to be aware of food contamination and the risks and consequences of foodborne illnesses. The findings also imply that stakeholders need to be proactive in their drive to ensure food safety along the food chain which means that they need to adhere to good agricultural practices, good hygiene practices as well as good manufacturing practices. Training of households on basic hygiene is also crucial. This could also help minimise the incidents of foodborne illness that threaten the lives of consumers.

7. Recommendations for further research

To take the food safety agenda forward, future research should focus on developing a focused strategy for the implementation of food safety in the informal sector. This should take into consideration the context and the importance of food security in rural livelihoods.

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References

- [1] Resnick D. Chapter 6: Governance: Informal food markets in Africa's cities. In: IFPRI book chapters: 2017 Global Food Policy Report. Washington, DC, USA: International Food Policy Research Institute; 2017. pp. 50-57
- [2] FAO. The informal food sector: Municipal support policies for operators. A briefing guide for mayors, city executives and urban planners in developing countries and countries in transition. In: Food in Cities Collection 4. Italy, Rome; 2003a
- [3] FAO. FAO's strategy for a food chain approach to food safety and quality: A framework document for the development of future strategic direction. In: Seventeenth Session, Item 5 of the Provincial Agenda. 31 March to 04 April 2003. Rome, Italy; 2003b
- [4] Glatzel K. Why supporting Africa's informal markets could mean better nutrition for poor city dwellers. In: IFPRI Blog: Research Post. Washington, DC: International Food Policy Research Institute; 2017
- [5] FAO. Promises and Challenges of the Informal Food Sector in Developing Countries. Rome, Italy: A joint publication by the Rural Infrastructure and Agro-industries division and the Nutrition and Consumer Protection division of the Agriculture and Consumer Protection Department of FAO. In collaboration with the Agricultural Economics and Engineering Department (University of Bologna, Italy) and the Department of Sociology and Anthropology (University of Ottawa, Canada); 2007
- [6] Sverdlik A. Promoting food security, safe food trading and vendors' livelihoods in informal settlements: Lessons from Nairobi. In: Urban Zoo Policy Brief. London, UK: University College London; 2017
- [7] Tinker I. Street foods: Testing assumptions about informal sector activity by women and men. *Current Sociology*. 1987;35(3):1-10
- [8] UN. Safety and Quality of Fresh Fruit and Vegetables: A Training Manual for Trainers. New York and Geneva; 2007 UNCTAD/DITC/COM/2006/16
- [9] Sheth M, Gurudasani R, Mudibibi R. Identification of hazards in street foods of Vadodara, India. *Indian Journal of Nutrition and Dietetics*. 2005;42:266-274
- [10] Tambekar DH, Jaiswal VJ, Dhanorkar DV, Gulhane PB, Dudhane MN. Identification of microbiological hazards and safety of ready-to-eat food vended in streets of Amravati City, India. *Journal of Applied Bioscience*. 2008;1:195-201
- [11] Schelin N, Wallin-Carlquist N, Cohn MT, Lindqvist R, Barker GC, Radstrom P. The formation of *Staphylococcus aureus enterotoxin* in food environments and advances in risk assessment. *Virulence*. 2011;2(6):580-592
- [12] Schmidt RH, Renee MG, Archer DL, Keith RS. General overview of the causative agents of foodborne illnesses. In: FSH033. Food Science and Human Nutrition Department, Florida Cooperative Extension Service, IFAS, University of Florida; 2003. Available from: <http://edis.ifas.ufl.edu/fs099>
- [13] Grace D, Roesel K, Makita K, Bonfoh B, Kang'ethe E, Kurwijila L, et al. *Food Safety and Informal Markets*. 2015
- [14] Debele A. Analysis of milk value chain: The case of Ada'a dairy cooperative in Ada'a district, East Shawa zone of Oronia regional state, Ethiopia [Masters thesis]. Leeuwarden,

the Netherlands: Van Hall Larenstein University; 2012

[15] Salla A. Review of the Livestock and Milk Value Chains and Policy Influencing Them in West Africa. Rome, Italy: FAO and ECOWAS; 2017

[16] FAO. Guide to Good Dairy Farming Practice. Italy, Rome: International Dairy Federation and the Food and Agriculture Organization of the United Nations; 2004

[17] Desissa F, Makita K, Teklu A, Zewde G, Grace D. Quantitative risk assessment of consuming milk contaminated with *Staphylococcus aureus* in Debre Zeit, Ethiopia. In: Roesel K, Grace D, editors. Food Safety and Informal Markets: Animal Products in Sub-Saharan Africa. New York: Routledge; 2015

[18] Kilango K, Makita K, Kurwijila L, Grace D. Food safety in milk markets of smallholder farmers in Tanzania: A case study of peri-urban wards in Temeke. In: Roesel K, Grace D, editors. Food Safety and Informal Markets: Animal Products in Sub-Saharan Africa. New York: Routledge; 2015

[19] Kouame-Sina SM, Yobouet AB, Costard S, Dadie A, Makita K, Grace D, et al. Bacterial risk assessment in informally produced milk consumed in Cote d' Ivoire. In: Roesel K, Grace D, editors. Food Safety and Informal Markets: Animal Products in Sub-Saharan Africa. New York: Routledge; 2015

[20] Yobouet AB, Kouame-Sina SM, Dadie A, Makita K, Grace D, Meile L, et al. *Bacillus cereus* risk assessment in raw milk produced in traditional dairy farms and consumed in the informal dairy sector in Abidjan, Cote d' Ivoire. In: Roesel K, Grace D, editors. Food Safety and Informal Markets: Animal Products in Sub-Saharan Africa. New York: Routledge; 2015

[21] Kone VB, Fokou G, Makita K, Grace D, Gnabeli YR, Bonfoh B. Social representation and perception of the quality of animal source food in Cinzana, Mali. In: Roesel K, Grace D, editors. Food Safety and Informal Markets: Animal Products in Sub-Saharan Africa. New York: Routledge; 2015

[22] Sow I, Makita K, Grace D, Costard S, Bonfoh B. Investigation on the risk of brucellosis linked to the production of milk in rural Cinzana, Mali. In: Roesel K, Grace D, editors. Food Safety and Informal Markets: Animal Products in Sub-Saharan Africa. New York: Routledge; 2015

[23] Appiah J, Tano-Debrah K, Amoa BB, Alpha MM, Makita K, Grace D. Assessment of the risk of consuming milk/milk products from informal markets contaminated with *Listeria monocytogenes*. In: Roesel K, Grace D, editors. Food Safety and Informal Markets: Animal Products in Sub-Saharan Africa. New York: Routledge; 2015

[24] Spengler M, Amenu K, Zarale AV, Markemann A. Assessment of water and milk quality in rural mixed crop-livestock farming systems: A case study of Lume and Siraro district, Ethiopia. In: Roesel K, Grace D, editors. Food Safety and Informal Markets: Animal Products in Sub-Saharan Africa. New York: Routledge; 2015

[25] Kabui K, Arimi SM, Kang'ethe EK, Omore A, Grace D. Milk quality control by bacteriological and compositional quality-based payment system in smallholder farms in Limuru and Eldoret, Kenya. In: Roesel K, Grace D, editors. Food Safety and Informal Markets: Animal Products in Sub-Saharan Africa. 2015