



# Food safety culture assessment using a comprehensive mixed-methods approach: A comparative study in dairy processing organisations in an emerging economy



Shingai P. Nyarugwe<sup>a</sup>, Anita Linnemann<sup>a</sup>, Loveness K. Nyanga<sup>b</sup>, Vincenzo Fogliano<sup>a</sup>, Pieterneel A. Luning<sup>a,\*</sup>

<sup>a</sup> Food Quality and Design Group, Department of Agrotechnology and Food Sciences, Wageningen University, P.O. Box 17, 6700 AA Wageningen, The Netherlands

<sup>b</sup> Institute of Food, Nutrition and Family Sciences, University of Zimbabwe, P. O. Box MP 167, Mt Pleasant, Harare, Zimbabwe

## ARTICLE INFO

### Article history:

Received 17 May 2017

Received in revised form

5 July 2017

Accepted 28 July 2017

Available online 30 July 2017

### Keywords:

Food safety culture

Food safety behaviour

Mixed-methods approach

Storytelling

Card-aided interview

## ABSTRACT

Food safety challenges are a global concern especially in emerging economies, which are in the midst of developmental changes. The challenges are directly or indirectly related to the behaviour and decision-making of personnel, and to an organisation's food safety culture. This study evaluated the prevailing food safety culture in three Zimbabwean dairy companies of different size (multinational, large and medium) using a comprehensive mixed-methods approach. Four key elements were assessed, namely enabling conditions, employee characteristics, actual behaviour and microbial safety performance. Card-aided interviews provided data on enabling conditions, and questionnaires and storytelling on employee characteristics. Observations and microbial analysis assessed actual behaviour and microbial safety performance, respectively. The multinational company demonstrated a more proactive food safety culture compared to the other companies, which operated at an active level as exhibited by multiple inconsistencies in the enabling conditions and compliance behaviour. The large company had a moderate microbial safety performance even though it operated in a potentially risky situation, which could have been mitigated by the food safety management system. The medium-sized company had a poor microbial safety performance likely related to noncompliance with sanitation requirements, negative attitudes towards personal hygiene and an ambivalent attitude towards sanitation. Our study demonstrated the ability of the mixed-methods approach to assess and distinguish an organisation's prevailing food safety culture into identified classification levels (reactive, active, proactive). Specifically, storytelling elicited respondents to share stories, which reflected the food safety and hygiene control attitudes.

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## 1. Introduction

Food safety is a global concern; the World Health Organisation (WHO) estimates that each year 600 million foodborne illness incidences occur worldwide (WHO., 2015). The highest burden of foodborne illnesses per population is in transitioning countries, particularly in Africa (WHO., 2015), as evidenced by inconsistent food safety (FAO, 2007; Kussaga, Jacxsens, Tiisekwa, & Luning, 2014). Kussaga et al. (2014) reported that 83% of the microbial

cases, including dairy products, reported in African countries, exceed microbiological limits. This is worrisome since dairy products significantly contribute to the human diet and are consumed by all population groups (Chimboza & Mutandwa, 2007; Papademas & Bintsis, 2010). Additionally, dairy products are easily perishable (Demirbas, Cukur, Yildiz, & Gölge, 2009) and are highly vulnerable to contamination (Chimuti, Midzi, Njage, & Mugadza, 2016; Papademas & Bintsis, 2010). Therefore, the food industry and regulators are putting significant efforts on improving food safety management systems (FSMS) and food safety performance (Consumer Goods Forum (CGF) (2011); Kussaga et al., 2014) in the dairy industry. However, FSMS are not always effective, as demonstrated by recurring food safety problems (e.g. Chimuti et al.,

\* Corresponding author.

E-mail address: [pieterneel.luning@wur.nl](mailto:pieterneel.luning@wur.nl) (P.A. Luning).

2016).

In transitioning countries such as Zimbabwe, deficiencies in food safety performance of dairy processing organisations have been attributed to outdated and/or poorly designed equipment, inadequate sanitation programs, restricted personal hygiene, unskilled/semi-skilled employees, and contaminated packaging material (Chimuti et al., 2016; Kussaga et al., 2014; Macheka, Manditsera, Ngadze, Mubaiwa, & Nyanga, 2013; Zimbabwe Economic Policy And Research Unit, 2014). These deficiencies have been linked to an insufficient food safety culture (FS-culture) (Pennington, 2009) and are directly or indirectly related to decisions made by individuals in an organisation.

The role of individuals in food safety/FS-culture has been argued by various authors (e.g. De Boeck, Mortier, Jaxsens, Dequidt, & Vlerick, 2017; Griffith, 2006). Individual characteristics (Fatimah, Strohbehn, & Arendt, 2014b; Griffith, Livesey, & Clayton, 2010b; Nyarugwe, Linnemann, Hofstede, Fogliano, & Luning, 2016) influence decision-making behaviour and actual food safety practices (e.g. De Boeck et al., 2017; Pacholewicz et al., 2016; Sanny, Luning, Marcelis, Jinap, & Van Boekel, 2010). Human behaviour contributes to food safety (De Boeck, Jaxsens, Bollaerts, & Vlerick, 2015; Griffith, 2006; Griffith, Livesey, & Clayton, 2010a) and has warranted the use and application of psychological models, behavioural frameworks and systems approaches, to assess and improve food safety (e.g. De Boeck et al., 2017; Griffith, 2006; Jespersen, Griffiths, Maclaurin, Chapman, & Wallace, 2016; Luning & Marcelis, 2006, 2009; Taylor, 2011).

Griffith et al. (2010a) defined FS-culture as “shared attitudes, values and beliefs towards food safety behaviours that are routinely demonstrated in food establishments”. FS-culture research, therefore, requires integrated analysis of personal/individual characteristics, organisational standards, practices/behaviour, FSMS and the context an organisation operates in (De Boeck, Jaxsens, Bollaerts, Uyttendaele, & Vlerick, 2016; Griffith, 2006; Luning et al., 2011; Nyarugwe et al., 2016; Powell, Jacob, & Chapman, 2011). Since several elements are interlinked, using multiple methods in FS-culture assessments could enhance research validity (Nyarugwe et al., 2016). This study aims to get an insight into the prevailing (FS-culture) of dairy organisations in an emerging economy in view of their context characteristics using a mixed-methods approach.

## 2. Material and methods

### 2.1. Elements used for assessing prevailing FS-culture

Four key elements (microbiological safety performance, actual behaviour, technological and organisational enabling conditions, and employee characteristics) were identified to systematically analyse an organisation's prevailing FS-culture. The elements were derived from previously validated organisational, safety and FS-culture studies (e.g. De Boeck et al., 2015; Fatimah et al., 2014b; Fleming, 2000; Glendon & Stanton, 2000; Griffith et al., 2010b) based on a review done by Nyarugwe et al. (2016), and have been pretested in dairy companies in an explorative study (Nyarugwe, 2013).

The techno-managerial approach, i.e. concurrent analysis of technological and managerial factors (Luning & Marcelis, 2006, 2009), was used as a principal research approach. De Boeck et al. (2015) also distinguished two routes; the techno-managerial route (FSMS and organisation's context) and the human route (i.e. employees' shared perception of leadership, commitment, communication, resources and risk awareness). These routes provide a basis for FS-culture assessment and are considered to influence food safety behaviour and the microbial output (De Boeck et al., 2017).

*Microbiological safety performance* reflects the actual food safety performance as previously described by Jaxsens et al. (2010) and could be influenced by an organisation's FS-culture as demonstrated by De Boeck et al. (2016). *Actual behaviour* defines the actual execution of work practices (Van den Berg & Wilderom, 2004) and is an outcome and reflection of the prevailing FS-culture. *Enabling conditions* are situational aspects of the system's environment aimed at supporting (when appropriate) personnel to appropriately execute work tasks. Both organisational and technological enabling conditions are interrelated and can be positive (support) or negative (hinder) employees to appropriately execute food safety or hygiene control tasks (Clayton, Griffith, Price, & Peters, 2002; Luning & Marcelis, 2006). The underlying assumption is that supportive conditions will enable more consistent compliance behaviour (Luning et al., 2011; Pacholewicz et al., 2016; Sanny et al., 2010).

*Employee characteristics* describe an individual's attitudes, knowledge and perceptions of food safety and hygiene control (Nyarugwe et al., 2016). Individuals with the right attitude will seek to do things right especially when they perceive the organisation supports food safety (Griffith et al., 2010a; Pacholewicz et al., 2016; Yiannas, 2009). Moreover, employees' characteristics (e.g. perceptions, attitudes) are assumed to affect compliance behaviour (Chen, Flint, Perry, Perry, & Lau, 2015; Luning & Marcelis, 2006; Nyarugwe et al., 2016).

To operationalise the elements and assess the prevailing FS-culture, 25 indicators (i.e. crucial aspects) were defined for the four elements. Indicators give a measure of the actual situation (Kirezieva, Jaxsens, Uyttendaele, Van Boekel, & Luning, 2013) and define the extent to which FS-culture is prioritised, embedded, practiced and shared among staff (Griffith, 2013). The indicators enabled data to be collected and assessed with the mixed-methods approach (section 2.3).

Indicators for microbiological safety performance measure actual food safety (e.g. De Boeck et al., 2015; Powell et al., 2011), while behaviour indicators measure actual practices displayed at critical steps and/or processes (Luning & Marcelis, 2009). For organisational conditions, the indicators leadership, communication, commitment, procedures, training and time were selected based on a review by Nyarugwe et al. (2016) and their potential contribution to food safety performance (De Boeck et al., 2015; Griffith et al., 2010a). For technological conditions, sanitation, protective clothing, handwashing facilities, zoning, hygiene design, and equipment maintenance were selected (Nyarugwe, 2013; Nyarugwe et al., 2016) as they are requisites for food safety and hygiene (Arendt, Ellis, Strohbehn, & Paez, 2011; De Boeck et al., 2015; Wright, Leach, & Palmer, 2012). For employee characteristics, knowledge, attitudes and perceptions were selected based on a pre-test and on previous studies (Nyarugwe et al., 2016; Powell et al., 2011; Van den Berg & Wilderom, 2004).

### 2.2. Description of the comparative study

#### 2.2.1. Characteristics of selected companies

A comparative study was executed in three Zimbabwean dairy companies. The companies were selected based on size, level of implemented FSMS, variety of dairy products and willingness to participate in the research. The companies represent medium (company A), large (company B) and multinational (company C) companies. Company A (CA) employs an average of 120 employees, is currently working towards HACCP certification, and mainly produces a range of ice cream and yoghurts. Company B (CB) has about 400 employees, a Standards Association of Zimbabwe certified HACCP-based FSMS, and produces a wide variety of milk, ice cream and yoghurts. Company C (CC) has approximately 300

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