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**NON-REGULATORY FOOD SAFETY MANAGEMENT IN  
NEW ZEALAND: MOTIVATION, EFFECTIVENESS, AND  
IMPLICATIONS**

**A thesis presented in partial fulfilment of the requirements of the degree**

**of Doctor of Philosophy**

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## **ABSTRACT**

Non-regulatory food safety management schemes, as a complement or alternative to mandatory regulation, have become a prevalent component of the food safety control system of the global food supply chain. This study focused on non-regulatory food safety management schemes implemented by the New Zealand food manufacturing industry, and examined the motivation for, challenges and impacts of, and the role of third-party certification bodies in the implementation of non-regulatory food safety management schemes. In particular, factors influencing the effectiveness of non-regulatory food safety management schemes and the quality of third-party food safety audits were examined.

It was found that non-regulatory food safety management is a key component of the entire food safety management system in New Zealand. The implementation of non-regulatory food safety management schemes was mainly driven by major customers' requirements, a desire to improve product quality and safety, and the desire to be recognized by the industry and the public. After the implementation of these schemes, enterprises experienced many desirable changes such as the improvement of product traceability, increasing food safety awareness of employees, and reduced customer complaints. Notably, the implementation improved the food safety culture. The major challenges encountered during the implementation of these schemes were increased paper work, and the cost of development and implementation. The service of third-party certification bodies was important for food companies to continuously improve their food safety management.

Enterprise characteristics made a substantial difference to the propensity of food manufacturing enterprises to implement non-regulatory schemes. These characteristics made notable differences to the relative importance of different incentives to implement non-regulatory schemes and the food manufacturing enterprise's experiences of the implementation of non-regulatory schemes.

The effectiveness of non-regulatory food safety management schemes was largely influenced by the food safety culture in food manufacturing companies and the quality of third-party food safety audits. A relatively robust food safety culture is in place in the food manufacturing industry, although there are areas needing improvement and change. The audit quality could be affected by accreditation, competition in the certification market, competency and integrity of auditors, audit scope, audit time, and surveillance activities of scheme owners.

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## **ABBREVIATIONS**

AB	Accreditation Body
BRC	British Retail Consortium
BSE	Bovine Spongiform Encephalopathy
CB	Certification Body
CFIA	Canadian Food Inspection Agency
CNCA	Certification and Accreditation Administration of the People's Republic of China
EFSA	European Food Safety Authority
FAO	Food and Agriculture Organisation of the United Nations
FDA	U.S. Food and Drug Administration
FMD	Foot and mouth disease
FSMS	Food safety management schemes
FSP	Food Safety Programme
FSSC 22000	Food Safety System Certification 22000
GAP	Good Agriculture Practice
GFSI	Global Food Safety Initiative
GMP	Good Manufacturing Practice
HACCP	Hazard Analysis and Critical Control Point
IAF	International Accreditation Forum
IEC	International Electrotechnical Commission
IFS	International Featured Standards
ISO	International Organisation for Standardization



ISO 22000	ISO 22000 Food Safety Management System
JAS-ANZ	Joint Accreditation System of Australia & New Zealand
KPI	Key Performance Indicator
MIBE	Ministry of Business, Innovation and Employment, New Zealand
MPI	Ministry for Primary Industries, New Zealand
NGO	Non-government organisation
NZTE	New Zealand Trade and Enterprise
RABSQA	RABQSA International Inc.
RMP	Risk Management Programme
SMART	Specific, Measurable, Achievable, Realistic, Traceable and Time bound
SME	Small and medium sized enterprise
SQF	Safety Quality Food
USDA	U.S. Department of Agriculture
WHO	World Health Organisation of the United Nations
WQA	Woolworths Quality Assurance
WTO	World Trade Organisation

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## CHAPTER 1 INTRODUCTION

### 1.1 Introduction

The safety of food is a non-negotiable priority for food manufacturers and farmers, and is an issue of paramount importance. A string of food safety scandals and food recalls (local or international) have exacerbated the concern of governments, the public and other stakeholders in food safety. Examples are the horsemeat scandal and Fonterra's precautionary recall of whey protein concentrates in 2013, the *E. coli* O104:H4 outbreak and illegal food additives in 2011, Melamine in infant formula scandal in 2008, foot and mouth disease (FMD) in 2001, and Bovine Spongiform Encephalopathy (BSE) in 1997. Outbreaks of foodborne disease continue to occur despite strengthened regulatory systems for food safety and a variety of food safety management systems adopted by food businesses.

The issue of food safety has grown in importance with the growth in complexity of the food supply chain (Aragrande et al., 2005; Buckley & Reid, 2010; Entis, 2007). The food supply chain's increased complexity has occurred within a dynamic environment (Gereffi, Humphrey, & Sturgeon, 2005). Raw materials can be procured globally, and processing technology is ever-changing (Cheftel, 2011). Moreover, people's food consumption and life style are continually changing. More and more people eat outside the home and buy ready-to-eat foods. Minimum or "zero" processed foods are increasingly preferred by some consumers as well (Ahvenainen, Ohlsson, & Bengtsson, 2002). All these changing factors put additional demands on food safety regulation and management.



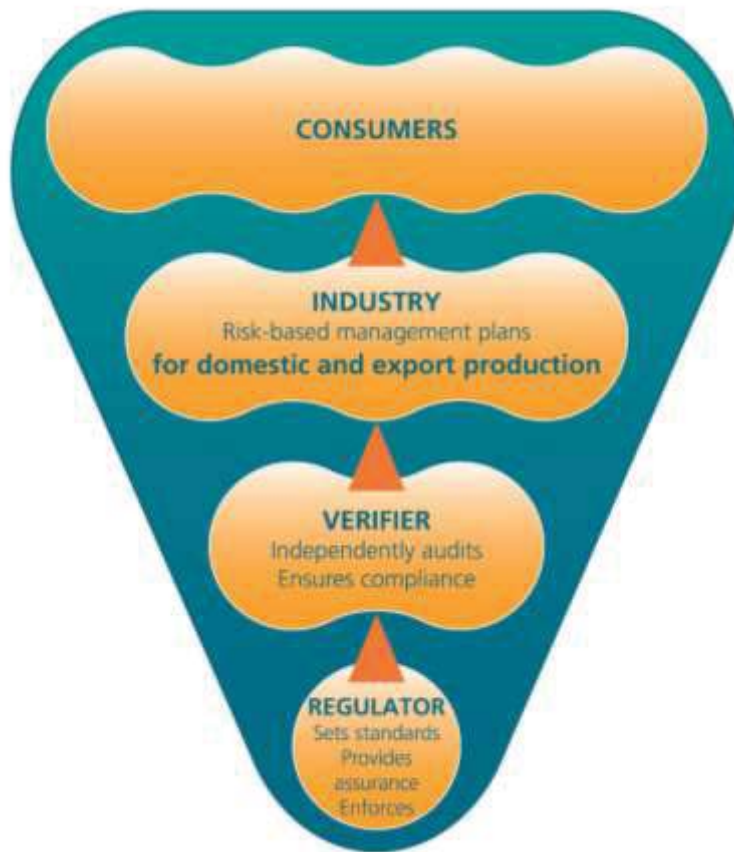
In response to increasing concern about food safety in the past 20 years, international organisations, governments, non-government organisations, retailers, and producer associations have introduced a large number of food safety management regulations, guidelines, standards and specifications to regulate and assure food safety (Da Cruz, Cenci, & Maia, 2006; Henson, 2007; Luning, Marcelis, & Spiegel, 2006; Neeliah & Goburdhun, 2007; Trienekens & Zuurbier, 2008). Some of them are compulsory requirements for food enterprises (such as government regulations), while others are not, such as the British Retail Consortium (BRC) Global standard for Food Safety, GLOBALG.A.P (GAP refers to good agriculture practice.), International Featured Standards Food (IFS Food), Safe Quality Food (SQF), Woolworths Quality Assurance (WQA), and ISO 22000 Food Safety Management System (ISO 22000). Those schemes which are not mandatory requirements from governments are defined as non-regulatory schemes in this study whether they are owned by governmental agencies, non-government organisations or the private sector.

For food businesses, most non-regulatory food safety management schemes (FSMS) are voluntary; however, they often become *de facto* mandatory in a business sense because they are adopted by dominant market players in the food supply chain (Henson, 2011). Food businesses are obliged to implement those schemes if they want to supply their products to those customers. For example, BRC Global Standard for Food Safety was originally set by a trade entity in the United Kingdom (UK) and has been adopted by retailers there. Food enterprises have to implement the BRC Global Standard for Food Safety in order to keep or gain supply contracts with retailers in the UK. To verify or confirm non-regulatory FSMS, most of them are audited or assessed by independent third-party certification bodies. Non-regulatory FSMS, as a complement

or alternative to mandatory regulation, have become a much more prevalent component of the food safety control system of the global food supply chain.

The food and beverage industry is the largest manufacturing sector in New Zealand according to the Manufacturing Survey (2012) of Statistics New Zealand, and is of paramount importance for the national economy. It consists of about 2,000 enterprises and employs more than 80,000 people (MBIE, 2012). Exports of food and beverages account for more than 10 per cent of the GDP by expenditure and represent more than half of the value of all merchandise exports. The food and beverage industry is dominated by several main categories: dairy, meat, seafood, fruit and vegetables, wine and specialty food industries.

The Ministry for Primary Industries (MPI) is the principal food safety regulating authority in New Zealand, and administers the four main Acts: the Food Act 1981, the Animal Product Act 1999, the Agricultural Compounds and Veterinary Medicines Act 1997, and the Wine Act 2003. As shown in Figure 1.1, a risk-based approach has been adopted. The industry should implement risk-based management programmes, such as Risk Management Programmes (RMPs) and Food Safety Programmes (FSPs), to meet the regulatory requirements. Those programmes have to be independently audited by MPI approved verifiers which are accredited against ISO/IEC 17020 Conformity Assessment—requirements for the operation of various types of bodies performing inspection. Besides the aforementioned regulatory requirements, food and beverage manufacturing enterprises have to meet some non-regulatory requirements whether they supply international or domestic markets.



**Figure 1.1: New Zealand food safety regulatory model**

*Source: Adopted from NZFSA (2009)*

A number of studies have investigated the incentives for, costs and benefits of, and challenges to food businesses to conform to food safety regulations in many countries. Some non-regulatory FSMS have been examined in the UK (Mensah & Julien, 2011), the USA (Fouayzi, Caswell, & Hooker, 2006), China (Zhou, Helen, & Liang, 2011) and other countries (Hassan, Green, & Herath, 2006; Karaman, Cobanoglu, Tunalioglu, & Ova, 2012; Tomašević et al., 2013). I was not able to find reports on the implementation of non-regulatory FSMS in the context of the New Zealand food manufacturing industry.

Factors that might influence the effectiveness of food safety management schemes such as Hazard Analysis and Critical Control Point (HACCP) have been investigated

(Cormier, Mallet, Chiasson, Magnússon, & Valdimarsson, 2007; Domenech, Escriche, & Martorell, 2008; Fotopoulos, Kafetzopoulos, & Psomas, 2009). However, factors that might impact on the effectiveness of non-regulatory food safety management schemes in the context of New Zealand food businesses have not been investigated. The association between enterprise characteristics and the propensity to implement certain food safety and quality standards has been examined in previous studies (Herath, Hassan, & Henson, 2007; Holt & Henson, 2000; Jin & Zhou, 2011; Masakure, Cranfield, & Henson, 2009; Scott, Wilcock, & Kanetkar, 2009; Zhou et al., 2011). As an effective tool of enforcement, third-party audits have been involved in non-regulatory food safety management schemes since their first introduction. The effectiveness of non-regulatory food safety management schemes can be affected by the quality of third-party food safety audits which have been questioned on their consistency, objectiveness and credibility (Albersmeier, Schulze, Jahn, & Spiller, 2009; Anders, Souza-Monteiro, & Rouviere, 2010; Holger, Friederike, Achim, & Gabriele, 2006; Jahn, Schramm, & Spiller, 2004a; Karapetrovic & Willborn, 2000).

This study focuses on non-regulatory food safety management schemes implemented by the New Zealand food manufacturing industry, and examines the motivation for, challenges and impacts of, and the role of third-party certification bodies in the implementation of non-regulatory FSMS. In particular, factors influencing the effectiveness of non-regulatory food safety management schemes and the quality of third-party food safety audits are examined. The ultimate purpose of this study is to examine the mechanism of non-regulatory food safety management scheme implementation, and to provide insights into their implications for pragmatic programme design and government policy which can encourage all stakeholders (e.g.

food industry, laboratories, third-party certification bodies and non-government organisations) to contribute to food safety management.

This study provides new information with empirical evidence from the New Zealand food manufacturing industry. It provides a deeper understanding of the process by which food manufacturing enterprises comply with non-regulatory FSMS, including what motivate food businesses to participate and comply with non-regulatory food safety schemes and how to maximise benefits to food businesses obtained from the implementation of these schemes. Moreover, this study also provides the baseline information on the implementation of non-regulatory food safety management schemes in New Zealand. This can benefit future research on this topic and can provide support for trade negotiations on food safety management issues.

## **1.2 Research questions**

The purpose of this study is to investigate the implementation of non-regulatory food safety management schemes in the food manufacturing industry in New Zealand.

Specifically, there are four main research questions:

- a. What factors motivate food enterprises to implement non-regulatory food safety management schemes?
- b. What are food manufacturing enterprises' experiences of the implementation of non-regulatory food safety management schemes in New Zealand?
- c. What are the impacts of enterprise characteristics on food manufacturing enterprises' experiences of the implementation of non-regulatory food safety management schemes?

- d. What are factors influencing the effectiveness of non-regulatory food safety management schemes?

### **1.3 Structure of the thesis**

The thesis is structured into nine chapters. This chapter is the introductory chapter. Chapter 2 reviews literature that is germane and central to this study. Specifically, it investigates the rise and operation of non-regulatory food safety management in the global food system, the motivation of food businesses to implement certain food safety management practices, factors influencing the effectiveness of non-regulatory food safety management, the role of third-party food safety audits in the system of non-regulatory food safety management, and the quality of third-party food safety audits.

Chapter 3 details the methods used in this study. Three methods were used to collect research data on non-regulatory food safety management in New Zealand: (1) document analysis, (2) questionnaire surveys, and (3) case studies.

Chapter 4 focuses on the results of the survey among food manufacturing enterprises. It investigates incentives for, challenges to, costs and benefits of, and the role of third-party certification bodies in the implementation of these non-regulatory FSMS. It also details the profile of the respondents to the survey, non-regulatory FSMS implemented in New Zealand, and the implementation process of non-regulatory FSMS.

Chapter 5 explores how enterprise attributes affect the propensity to implement non-regulatory FSMS and investigates the association between enterprise characteristics and the relative importance of different incentives.

Chapter 6 aims at identifying the impacts of enterprise attributes on the experiences of non-regulatory food safety management schemes. It examines the impact on the implementation strategies of non-regulatory FSMS, the association between changes as a consequence of implementing non-regulatory FSMS and enterprise characteristics, and the impact on the challenges during the implementation of non-regulatory FSMS.

Chapter 7 addresses the results of the survey among certification bodies. It analyses the role of third party audits in the implementation of non-regulatory FSMS and the certification processes of different types of schemes. Factors influencing audit quality are examined and ways to improve the quality of third-party audits are proposed.

Chapter 8 investigates the food safety culture in the food manufacturing industry in New Zealand. The concept of food safety culture is defined and analysed from different levels and dimensions. The impacts of enterprise characteristics (non-regulatory FSMS in place or not, sub-sector, size, and exporting status) on food safety culture are also examined.

Chapter 9 ties all the research results together and discusses the issues in depth. The key findings are summarised. Recommendations are included at the end.

## **CHAPTER 2 LITERATURE REVIEW**

### **2.1 Introduction**

This chapter aims to critically review the rise of non-regulatory food safety management schemes, their operation, motivation of food manufacturers to implement these schemes, and their effectiveness. Section 2.2 looks at the developments in food safety management and the rise of non-regulatory food safety management schemes. Section 2.3 discusses the types and operational mechanism of these schemes. Section 2.4 reviews the motivation and incentives of food manufacturers to implement these schemes. The effectiveness of these schemes is presented in section 2.5 and conclusions are made in Section 2.6.

### **2.2 The rise of non-regulatory food safety management schemes**

#### **2.2.1 New challenges to food safety**

Changes in the food supply chain, society and environment have made the issue of food safety more complicated and put additional demands on food safety regulation and management (Cheftel, 2011; Havelaar et al., 2010; Woteki & Kineman, 2003).

##### **2.2.1.1 Globalisation of the food supply chain**

Due to the integration and concentration of the food industry, liberalisation and globalisation of the food trade, there have been dramatic changes in both the domestic and international food markets in the last several decades (Buckley & Reid, 2010; Luning, Bango, Kussaga, Rovira, & Marcelis, 2008; Sofos, 2008; WHO, 2002). The food supply chain has been globalized (Jaffee & Henson, 2004 ; Jongen & Meulenberg, 2005; Luning, Devlieghere, & Verhé, 2005; OECD, 2004; Radovanovic, 2011). It is becoming increasingly complicated within a dynamic environment (Ercsey-Ravasz,



Toroczka, Lakner, & Baranyi, 2012; McMahon, 2013). Raw materials can be procured globally, and the technology of agriculture, food production and distribution is changing rapidly. Food production, storage, distribution and other parts of the food supply chain increasingly extend beyond national boundaries. Food can be available to thousands of people around the world a short time after it is manufactured. These changes in the food supply chain create the conditions under which foodborne illnesses can spread widely.

The globalized food supply chain creates new sources of risk because the chain is fragmented among multiple companies (McMahon, 2013). It is also difficult to coordinate along the food chain and control these risks due to geographic and/or cultural distance (Humphrey, 2008). Large retailers in developed countries have become the dominant players of the global food supply chain, and have invested millions in brand capital (Burch & Lawrence, 2007). The actions taken by these dominant players to control and assure food safety have complex implications for players up-stream of the supply chain, even though they may be far away from each other geographically and economically (Asfaw, Mithöfer, & Waibel, 2007; Havinga, 2006; Konefal, Mascarenhas, & Hatanaka, 2005). National regulations of developed countries have increasingly focused on the conditions of production of imported food and placed legal responsibility on to food business operators to ensure food safety.

#### **2.2.1.2 Reforms of food safety regulations**

Although there are well-developed food safety regulation systems in most developed countries, these systems have changed profoundly in recent years (Chowdhury & Wessel, 2012). The regulator and consumer have paid increasing attention to food

safety (Kinsey, 2001). In spite of developments in the technology of agriculture, food processing and other fields in relation to the food industry, outbreaks of foodborne disease are increasing in both developed and developing countries, provoking consumer concerns on food safety and undermining their confidence in food safety control (Henson & Humphrey, 2008; Jaffee & Jabbar, 2005; Marsden, 2010; Mensah & Julien, 2011). Governments had to introduce more extensive and more stringent food safety regulations to mitigate these issues. Therefore, companies face new compliance challenges, and have to strive to find approaches to minimise the cost of compliance.

Food safety concerns have resulted in increasingly stricter product controls, such as tighter residue limits for pesticides and drugs. Meanwhile, more process controls based on risk assessment have been introduced in both regulations and non-regulatory standards. The most widely accepted control system is HACCP based FSMS. The trend towards process management-based approaches (focusing on how food is produced and the controls on process) reflects doubts of the effectiveness and economic efficiency of performance-based approaches (focusing on whether the final product complies with certain product criteria) (Golan et al., 2004; Luning & Marcelis, 2009; Radovanovic, 2011).

In some industrial countries especially in Europe, governments have gradually relocated the responsibility of assuring food safety to the private sector. This shift has resulted from the shift to neo-liberalism, enhanced financial limits and a belief of co-regulation between the public and private sector (Busch et al., 2005; Garcia Martinez, Verbruggen, & Fearne, 2013; Marsden, 2010; Rouvière & Caswell, 2012). The Food Safety Act 1990 in the UK introduced 'due diligence', which means that food

companies should take every reasonable measure to ensure food safety. It is one of the important characteristics of the recent evolution of European food safety regulations where the involvement and commitment of the private sector has increased in food safety management and regulating (Marsden, 2010). The 2001 European Regulation (EC) No. 178/2002 that came into force in 2005 had this objective.

Food businesses have to be responsible to assure food safety by developing their own food safety management systems, and to ensure the effectiveness of their system through auditing. Meanwhile, government will inspect and verify these audits (Marsden, Flynn, & Harrison, 2000). In some countries, this shift is combined with a “name and shame” sanction for food legislation violations which can damage the brand capital of food businesses. In the UK, after the introduction of the 1990 Food Safety Act, food businesses can avoid legal sanction only if they can demonstrate that they have undertaken “due diligence” to ensure the safety level of the food they manufacture or deliver.

#### **2.2.1.3 Social and environmental changes**

Rapid urbanization results in greater demand for the distribution and storage of food. Moreover, people’s life styles and eating patterns are continually changing. More and more people eat outside home and buy ready-to-eat foods. Minimum or “zero” processed foods are increasingly preferred by more consumers as well. The social demography of the world has also changed dramatically, which is another challenge to food safety (Havelaar et al., 2010). It has been reported that the proportion of the overall population susceptible to foodborne illnesses is increasing (Buckley & Reid, 2010). Those people, including the elderly, infants, pregnant women, and immune-

compromised individuals, are much more vulnerable to foodborne illnesses than the general population. Changing ethnic structure leads to changing food consumption patterns which can potentially cause food safety issues (Radovanovic, 2011).

Coupled with the changes in the regulatory system and food industry, the changes of demography and other social factors have led to consumer's heightened expectations and demands in relation to food safety and quality (Buzby, Frenzen, & Rasco, 2001; Jaffee, 2003; Jaffee & Henson, 2004 ). Consumers focus on not only the safety level of food but also the way in which food is manufactured. The concept of food safety has been broadened from "fit for human consumption" to a wide range of safety attributes (Luning et al., 2005; McElhatton & Marshall, 2007). Environment, animal welfare, workers' health and other factors have also been concerns of consumers. Consumers are seeking more reliable information on safety assurance of the food they buy and the way in which the food is produced (Jaffee & Henson, 2004 ; Kinsey, 2003; Trienekens & Zuurbier, 2008).

Increased environmental pollution adds a new challenge to food safety. Heavy metals and Persistent Organic Pollutants (POPs, e.g. dioxins and polychlorinated biphenyls) can contaminate food through the air, water or soil pollution (WHO, 2007). New and emerging pathogens have also caused several severe foodborne illness outbreaks, e.g. European *E. coli* O104:H4 outbreak in 2011.

### **2.2.2 Trends in food safety management**

The management of food safety has evolved dramatically during the last two decades. This development has affected the way in which food safety is regulated and governed in the world. The following are noteworthy trends in food safety management.

### **2.2.2.1 Increasing focus on the food supply chain**

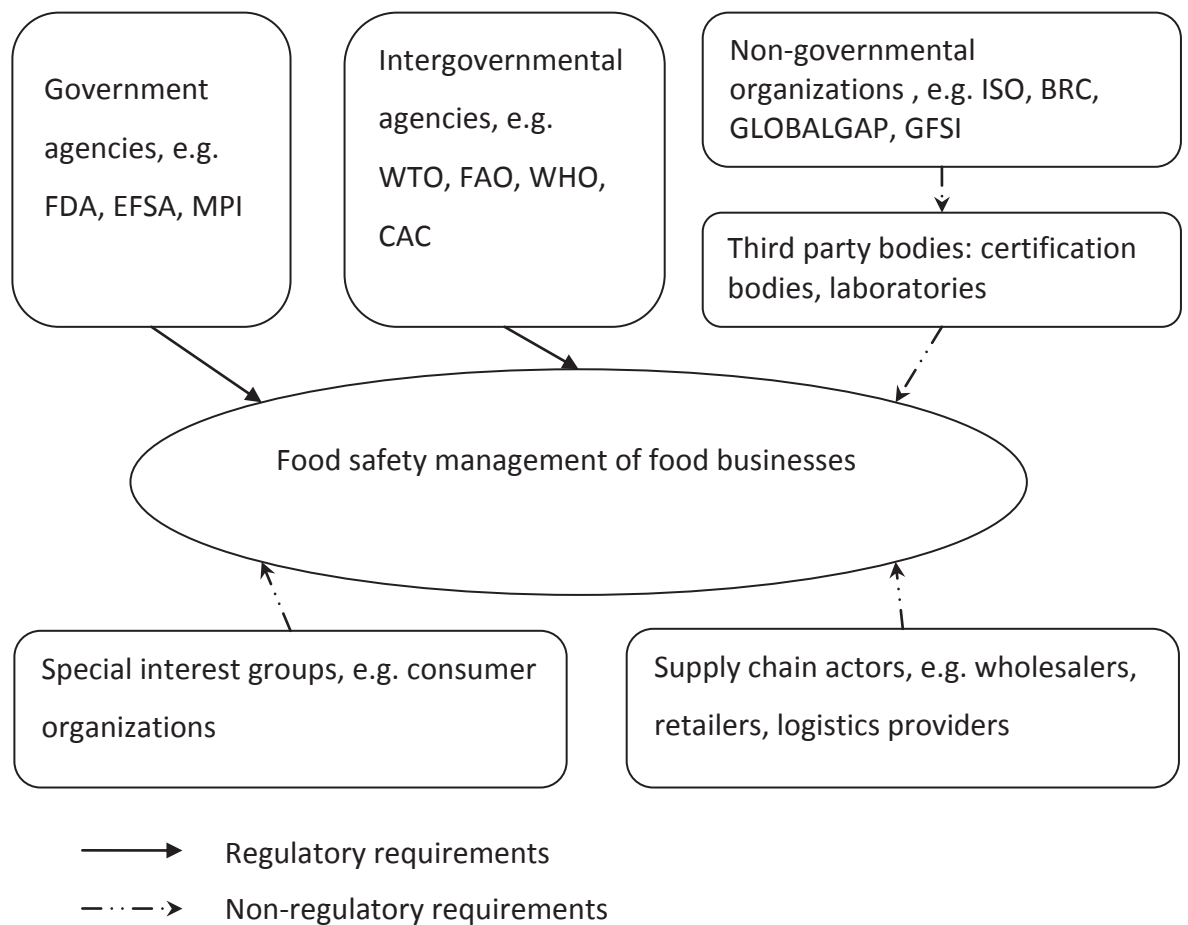
An holistic and systematic approach is increasingly being adopted to control food safety hazards at each stage in the food supply chain (Buckley & Reid, 2010; WHO, 2002). Hazards can be introduced to the food supply chain and can continue to enter or be aggravated and exacerbated at any node in the chain until the food is consumed. As a result, food safety problems can take place at any step from production to consumption. Through this approach, each step in the food supply chain is considered as part of a whole system, and food safety can be controlled through the entire supply chain.

### **2.2.2.2 More stakeholders involved in food safety management**

One of the important characteristics of the recent evolution of European food safety regulations is more involvement and commitment of the private sector (Garcia Martinez et al., 2013; Marsden, 2010). This shift resulted from growing neo-liberalism, limited government budgets and a belief that both the public and private sectors should share responsibility for food safety (Busch et al., 2005; Marsden, 2010).

Food safety is a shared responsibility among all stakeholders (Figure 2.1), including governments, the food industry, academics, laboratories, third-party certification bodies, consumers and non-government organisations (Buckley & Reid, 2010; Mensah & Julien, 2011; Motarjemi & Mortimore, 2005). Governments need to introduce and enforce regulations on food safety, and maintain an effective regulatory system. The food industry is now expected to implement holistic and systematic approaches to manage and control food safety, and meet the requirements from both governments and customers. Academia is expected to provide sufficient scientific research on food

safety, underpinning the food safety risk assessment and management. Business laboratories and third-party certification bodies have played an increasingly important role for food safety management. As the final node in the food supply chain, consumers need to handle food appropriately to ensure its safety. In addition, the consumer and non-government organisations can also play an important role to advocate and monitor the governmental regulatory process.



**Figure 2.1: Major stakeholders in the food safety management system**

*Source: Adapted from Mensah and Julien (2011)*

### **2.2.2.3 A move towards a risk-based preventive approach**

In many countries, the food safety regulating systems are being transformed from traditional systems into risk-based preventive systems. The traditional food safety regulating systems are based on the legal definition of unsafe food, and are supported by enforcement institutions to remove unsafe food and sanctions for the responsible stakeholders (McMahon, 2013). They could not provide a preventive approach to regulating food safety, nor could they effectively respond to new challenges to food safety (WHO, 2002). On the contrary, the risk-based preventive regulating systems are underpinned by scientific knowledge of food safety and can control food safety proactively.

### **2.2.2.4 A proliferation of food safety standards**

A myriad of food safety standards have been issued by governments, intergovernmental organisations, food industry associations, retailers and non-government organisations (Mensah & Julien, 2011; Trienekens & Zuurbier, 2008). These standards are either performance based or process-based, and have become much more stringent. The most important function of food safety standards (both public and private, mandatory and voluntary) is to expedite the vertical coordination of the food supply chain among all players, and then to transfer reliable information about the attributes of products and the way in which they are produced, manufactured and distributed (Gereffi et al., 2005; Humphrey & Schmitz, 2000, 2001).

### **2.2.3 The rise of non-regulatory food safety management schemes**

The prevalence of non-regulatory food safety standards, most of which are private standards, is an important trend in the governance of the global food supply system in

the past 20 years (Henson, 2007; Herath et al., 2007; Jaffee & Henson, 2004 ; OECD, 2004), driven by the food safety regulatory change, the restructuring of the global food system, and other challenges discussed in 2.2.1. An analogous system has evolved in environment management, where a non-regulatory programme has been an effective means to reduce pollution with limited government budgets. This has been a “win-win” strategy and an alternative to mandatory regulations (deLeon, Rivera, & Manderino, 2010; Potoski & Prakash, 2004). Non-regulatory standards are normally combined with second or third party certification to gain enforcement after being adopted by predominantly major players in the global food system (Busch et al., 2005; Henson, 2007). Similarly, to verify or assess the conformity of food manufacturing enterprises to non-regulatory food safety standards, independent third-party certification bodies are used. Non-regulatory food safety standards, combined with a system of assessment and a governance structure enforcing effectiveness, is the essence of non-regulatory food safety management schemes.

Although the focus of non-regulatory food safety schemes is food safety and the integrity of the food safety management system, they can also include other aspects of food such as environmental protection, worker health, animal welfare, etc. It is notable that these schemes increasingly address the control of the processes of food production (Henson & Humphrey, 2009). “Process-control” schemes generally underpin food firms’ claim about what kind of processes and practices have been followed during production, transportation and distribution, and often involve second or third party certification as monitoring and enforcement institutions (Busch et al., 2005). Rules and procedures are codified into a written statement of these schemes to provide instructions on how to implement, monitor and enforce rules. Furthermore,



these schemes also involve a governance structure of monitoring and enforcement, as well as procedures to generate and adopt changes to the requirements of the scheme. However, the strength and effectiveness of these institutions may be questionable (Albersmeier et al., 2009; Anders et al., 2010; Davey & Richards, 2013).

Non-regulatory food safety schemes have two common features, albeit with differing origins: (1) relying on documentation of production, and (2) involving second or (increasingly) third-party auditing and certification (Henson & Humphrey, 2009; Hobbs, 2010; Holleran, Bredahl, & Zaibet, 1999). The range of schemes that private companies may adopt is illustrated in Table 2.1. It is not an exhaustive list of schemes which are implemented in both developed and developing countries.

**Table 2.1: Examples of non-regulatory food safety schemes**

<b>Individual Firm Schemes</b>	<b>Collective National Schemes</b>	<b>Collective International Schemes</b>
Nature's Choice (Tesco)	British Retail Consortium Global Standard for food safety	International Featured Standards Food (IFS Food)
Filières Qualité (Carrefour) – version applied in multiple countries	Freedom Food (UK)	Safe Quality Food (SQF) 1000/2000
Field-to-Fork (Marks & Spencer)	Qualitat Sicherheit (QS, Germany)	Global Food Safety Initiative (GFSI)
Filière Contrôlée (Auchan) –version applied in multiple countries	Farm Assured British Beef and Lamb	GLOBALG.A.P
P.Q.C. (Percorso Qualità Conad)	NZ GAP (New Zealand)	ISO 22000: Food safety management systems
WQA (Woolworths Limited)	ChinaGAP (China)	

Source: Based on Aragrande, et al. (2005) and WTO (2007), with additional examples from author's elaboration.

## **2.3 The typology and operational mechanisms of non-regulatory food safety management schemes**

### **2.3.1 Mandatory or voluntary standards**

Non-regulatory food safety standards could be developed by both governments and private entities including companies, industry associations and NGOs. Standards set by governments may be mandatory or voluntary. Brunsson and Jacobsson (2000) named voluntary standards as “optional laws”. For example, ChinaGAP is developed by the Certification and Accreditation Administration of the People’s Republic of China (CNCA), which is one of the agencies of the Chinese central government. However, ChinaGAP is a voluntary food safety programme which encourages farmers or farmer groups to implement Good Agriculture Practice in production.

Whether a non-regulatory standard is voluntary or mandatory depends on what kinds of entities adopt the standard. It is the nature of organisations to require another organisation to implement a certain standard and comply with it (Brunsson & Jacobsson, 2000). Non-state stakeholders can adopt non-regulatory standards and require other actors to comply with it; there is no legal sanction from non-compliance even though these standards may become *de facto* mandatory in a business sense because they are adopted by dominant market players in the supply chain. At the same time, government agencies can also adopt non-regulatory standards and give them statutory power; then compliance with those standards is mandatory, and those standards can be referred to as legally-mandated private standards. Mandatory schemes can also evolve into voluntary ones. For example, the SQF series of standards was first set by the Government of Western Australia, which should be categorized as a public voluntary standard because of non-mandated implementation. However, they

were later bought by the Food Marketing Institute (FMI) which is an industry organisation of the food retailers and wholesalers in the US, and then they should be reclassified as private voluntary standards (Trienekens & Zuurbier, 2008).

### **2.3.2 Types of non-regulatory food safety management schemes**

Based on the classification of the WTO (2007) on private standards, three forms of non-regulatory food safety management schemes are distinguished: (1) individual company schemes, (2) collective national schemes, and (3) collective international schemes (Table 2.1). This classification is defined by characteristics of the entities that develop the schemes combined with the reach of the schemes. However, the nature of these schemes is dynamic, and they evolve over time. Therefore, the classification may be more complicated than it appears.

#### **2.3.2.1 Individual company schemes**

Individual company schemes are developed by individual firms, main players of the food supply system (predominantly large food retailers), and are implemented among their supply chains (WTO, 2007). These schemes are usually related to these firms' own brand products and are proprietary to them (Fuchs, Kalfagianni, & Arentsen, 2009). Examples include Carrefour's Filières Qualité, Tesco's Nurture and Woolworths' Woolworths Quality Assurance (WQA). Such schemes may be implemented nationally or internationally. Some of them are applied in all subsidiaries of the parent firm. Even if some are used for a retailing operation in a single region or country, these schemes themselves have international implementation because they are applied to suppliers all over the world, with the globalization of the food supply chain (Lee, 2006). For example, farmers in China will have to be certified to the Tesco Nature's Choice

scheme in order to export products to Tesco in the UK (Lee, 2006; Mangelsdorf, Portugal-Perez, & Wilson, 2012).

### **2.3.2.2 Collective national schemes**

Collective national schemes are set by government agencies or collective organisations that operate within individual countries such as industry associations and other NGOs (WTO, 2007). For the schemes developed by government agencies, food businesses are encouraged to implement them voluntarily. For schemes developed by collective organisations, they reflect the interests of commercial food businesses (e.g. food retailers, manufacturers or producers) or NGOs. All food businesses are free to adopt these schemes to enforce food safety management. Some of them do have international reach albeit with named “collective national schemes”. For example, the British Retail Consortium (BRC) Global Standard for Food Safety was originally set by a trade entity in the UK and is now applied to suppliers in many countries after being adopted by retailers in the UK (BRC, 2011). The BRC Global Standard for Food Safety can also be implemented by food manufacturing enterprises not supplying retailers in the UK, if they believe that the implementation can bring them a competitive advantage (Kill, 2007). Some of these schemes are designed for the purpose of product differentiation, such as the Farm Assured British Beef and Lamb (in the UK). In this case, they are frequently “visible” to the consumer with a certain logo or mark, claiming the superior attributes of foods which are produced by food businesses complying with these schemes (Henson, 2007). It is not uncommon for national schemes to move to international ones if the entities developing and controlling these schemes are internationalized (WTO, 2007).

### **2.3.2.3 Collective international schemes**

Collective international schemes are identified based on the reach of the schemes. The organisations developing these schemes usually have international membership (WTO, 2007). For example, ISO 22000, developed by International Standard Organisation (ISO) in 2005, has been implemented by food businesses all over the world (SAMIL, 2009).

GLOBALG.A.P (formerly EurepGAP) was firstly established by an international collaboration of European retailers, and now has a more diversified and international membership (GLOBALG.A.P., n.d.). The SQF series of standards owner, the Food Marketing Institute (FMI), has a membership of firms in many countries (Busch et al., 2005). Some owners of collective international schemes may be non-businesses. These schemes are set by different combinations of public, NGO and private groups with different proportions of power to take part in the governance of these schemes (Abbott & Snidal, 2009). These organisations can represent the interests of business companies, NGOs, the public, or all of these.

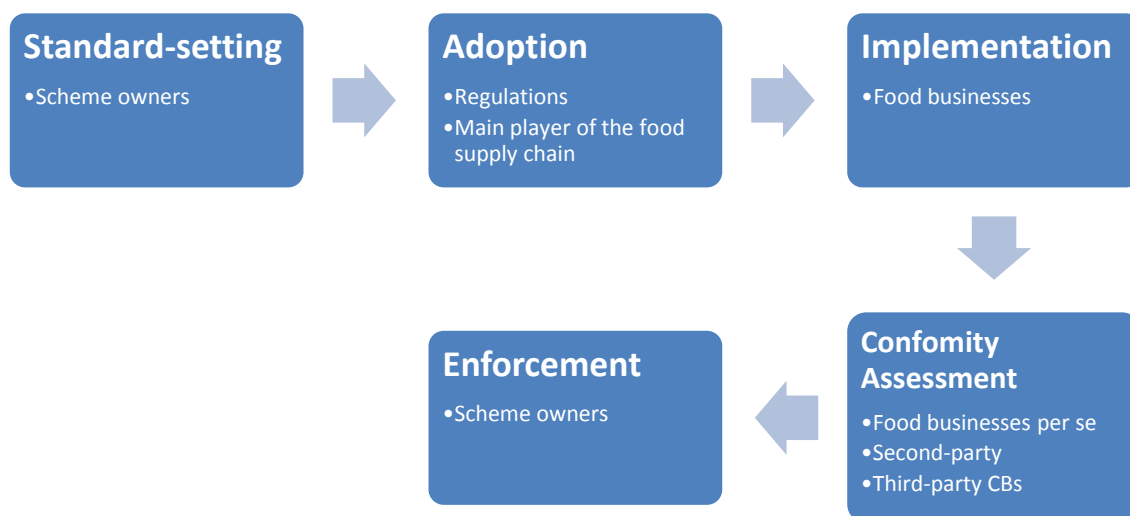
### **2.3.3 Operational mechanism of non-regulatory food safety management schemes**

#### **2.3.3.1 Governance of non-regulatory food safety management schemes**

A non-regulatory scheme should involve five key functions: standard-setting, adoption, implementation, conformity assessment, and enforcement, whether it is public or private (Henson & Humphrey, 2009).

Figure 2.2 illustrates how the non-regulatory food safety management schemes work. Standard-setting is the introduction of a standard through formulating the requirement with written rules and procedures. Adoption is the decision made by an organisation to adopt the standard, which can take various forms. The standard can be

one set by the firm itself, or developed by the coalition of the firm and others, or created by another entity (Henson & Humphrey, 2009). A company can adopt a standard through requiring its suppliers to implement it. The decision to adopt schemes is a pivotal driver for the proliferation of non-regulatory schemes (Trienekens & Zuurbier, 2008). It also enables non-regulatory schemes to be involved in the global food value chains (Hatanaka & Busch, 2008; Hobbs, 2010). Implementation is the process that a standard is carried out by organisations which intend to comply with the standard. Conformity assessment is the verification and assessment of companies' compliance to the requirements of the schemes (Almeida, Pessali, & de Paula, 2010). This involves the procedures of verification and provides documented evidence of conformity (Tanner, 2000). Conformity can be assessed in various ways, including self-declaration by companies implementing the scheme, inspection or audit by the entity adopting the scheme (referred to as second-party certification), and inspection by a third-party certification body (referred to as third-party certification) (ISO/IEC, 2011). Third-party certification has been increasingly involved in these schemes and is becoming the norm (Hatanaka, Bain, & Busch, 2005). The schemes have to include the requirements for approval of the certification bodies which are competent and suitable to verify compliance. Enforcement deals with non-compliance. The scheme should have some procedures to deal with the non-compliance of implementers and certification bodies, either by taking corrective action or suspending and even withdrawing the recognition of their conformity (Jahn, Schramm, & Spiller, 2004b; Monteiro & Anders, 2009).



**Figure 2.2: Operational mechanism of the non-regulatory scheme**

Non-regulatory schemes are developed by a variety of public and private or non-government entities that differ in the institutional structure and the level of integration of standards setting, adoption and implementation (Nicholson, 2011).

There are differences in terms of the structure of decision-making, rigidity, inclusivity and transparency (Henson & Humphrey, 2009; Trienekens & Zuurbier, 2008). Table 2.2 illustrates the classification of these scheme setters based on their institutional form, distinguishing between individual company schemes and collective ones (Henson & Humphrey, 2009).

**Table 2.2: Organisational forms of non-regulatory food safety schemes-setters**

Category of	Organisational Form	Examples
<b>Schemes</b>		
<b>Individual company schemes</b>	Food companies	Nature's Choice (Tesco)
		Filière Qualité (Carrefour)
		Field-to-Fork (Marks & Spencer)
	Standards companies or certification bodies	ProSafe Certified AIB Consolidated Standards
<b>National or</b>	Government agencies	ChinaGAP
<b>International</b>	Industry associations	BRC Global Standard for Food Safety
<b>Collective Schemes</b>		IFS Food
	standards coalitions	GLOBALG.A.P

Source: author's elaboration, based on Henson and Humphrey (2009)

The relative importance of different organisational forms in the development of non-regulatory food safety schemes has changed (Fulponi, 2006; Henson & Humphrey, 2008). For example, in Europe, where non-regulatory food safety management schemes are most popular, a shift can be seen from individual food company and certification body schemes to collective schemes, set by industry associations and standards coalitions. In the middle of the 1990s, the UK retail sector started to develop non-regulatory food safety schemes (Marsden, 2010). Some retailers had their own food safety schemes and usually audited their suppliers using their own staff, while other retailers adopted the schemes developed and audited by third-party companies. However, there were considerable differences in the requirements among those



schemes, and then suppliers had to be audited many times if they were supplying a number of these retailers (Verbruggen, 2013). In order to mitigate this issue, collective food safety schemes evolved. BRC was involved, which was a trade association representing retailers. The BRC Standard (now the name is BRC Global Standard for Food Safety) was developed in 1998 by the British Retail Consortium, which was adopted by most retailers (BRC, 2011, n.d.).

After this, retailers in other European countries witnessed the benefits of a collective food safety scheme (Marsden, 2010). In 2000, the German retail federation, Hauptverband des Deutschen Einzelhandels (HDE), developed the International Food Standard (now called International Featured Standards Food, IFS Food) (IFS, 2011). In 2003, the Fédération des Entreprises du Commerce et de la Distribution (FCD), an organisation representing French food retailers, joined the IFS and developed the scheme collaborating with HDE. Within 2005/2006, retailer associations of Italy also joined in the IFS. These three retailer associations collaborated to develop the updated version of the scheme (IFS, 2011).

### **2.3.3.2 Mechanism of scheme-setting of several major food safety schemes**

Different mechanisms are employed by the scheme owners to develop schemes according to their different organisational forms.

#### ***Individual Food companies***

Individual food company schemes are developed and adopted by food companies, which are the main players in the food supply system (predominantly large food retailers and food service companies) (Marsden, 2010). The first two functions of an operational scheme, standard-setting and adoption, are typically closely associated in

this case (Henson & Humphrey, 2008). The standard-setting can be conducted by companies' own technologists or external consultants. These processes are likely to be closed, with little or even no space for input from other stakeholders if they are not specifically invited (Fuchs, Kalfagianni, & Clapp, 2010). Food companies may also establish a mechanism to widen the range of input during standard-setting (Fuchs, Kalfagianni, & Havinga, 2009). For example, the revision of Tesco Nature's Choice is conducted by a Technical Advisory Committee of multiple stakeholders including Tesco's own technologists, representatives of producers, independent experts and CMI which is the registrar of this scheme (TESCO, 2011).

Second or third party certification systems are usually involved in food company schemes and suppliers have to be audited annually (Fuchs, Kalfagianni, & Arentsen, 2009). Third party certification bodies should be approved by the scheme owners. For example, Woolworths has approved several certification bodies to conduct WQA audits all over the world (Woolworths, 2013). In other schemes, conversely, audits are undertaken by the schemes owners' technical staff. This case is a second party audit (ISO/IEC, 2004). The choice between second and third party audit is determined by the company's perception of cost and risk. Although third party certification can reduce the cost to the owner of the scheme by laying down the cost to the suppliers, it may be a lower level of assurance on risk management than audits undertaken by food companies own technical staff (Henson & Northen, 1998).

### ***Standards companies or certification bodies***

Standards companies or certification bodies tend to set schemes with their own technical resources and/or external experts (Henson, 2011). Meanwhile, they are

usually open to any comments from potential adopters of schemes. Most of these entities are for profit and their businesses depend on the adoption of their schemes by the main stakeholders of the food supply chain (Fuchs, Kalfagianni, Clapp, & Busch, 2011). In the US, schemes developed by standards companies or certification bodies continuously play an important role in food safety management (Henson, 2011). These schemes explicitly cover both mandatory and voluntary aspects with respect to the food safety requirements of the US government. In other words, these schemes comprise a synthesis of regulations and public voluntary standards. For example, most schemes of the American Institute of Baking (AIB) international are based on mandatory and voluntary requirements of the Food and Drug Administration (FDA) and/or the United States Department of Agriculture (USDA) (Henson & Humphrey, 2009). These companies generally certify the schemes developed by them.

### ***Government agencies***

Government agencies can promulgate voluntary standards to encourage food businesses to implement certain food control protocols (Marsden, 2010). As mentioned above, CNCA developed the ChinaGAP certification scheme to promote the application of Good Agriculture Practice in the horticulture, livestock, and aquaculture industries (CNCA, 2010). CNCA sets the voluntary national standards on GAP, and issued regulation on the implementation of ChinaGAP certification (CNCA, 2010; Mangelsdorf et al., 2012). Certification bodies must be approved by CNCA to carry out the ChinaGAP certification service (CNCA, 2010). Auditors of ChinaGAP certification have to attend training courses recognised by CNCA and pass exams. A technical committee, which consists of representatives from government agencies, producers,

certification bodies and institutes, is responsible for the setting and revision of ChinaGAP standards (CNCA, 2010).

### ***Industry associations and standards coalitions***

Collective schemes, whether they are developed by industry associations or standards coalitions, are likely to be set and revised by technical committees composed of representatives of member companies (Marsden, 2010). In some cases, the technical committee may include external consultants and representatives of scheme implementers (Henson & Humphrey, 2009). The decision-making structure of these organisations ensures effective inputs from their members. The secretariats of these organisations play an important role in coordinating the setting process of schemes. In the setting process, the technical committee has to reconcile different needs and demands of members including the adopters (Henson & Humphrey, 2008). Therefore, the setting process of collective schemes takes relatively longer than that of individual food company schemes. Although the cost of members to participate in the setting process of collective schemes is less than the cost to develop individual schemes by themselves, they have to sacrifice some of their benefits with the compromises necessary to establish a collective scheme (Marsden, 2010). In other words, the collective scheme cannot reflect all the needs and demands of individual companies.

The setting process of BRC Global Standard for Food Safety substantively involves all major adopters (the major retailers in the UK), and is in the charge of an internal standards team with guidance from a Technical Advisory Committee composed of food retailers and other stakeholders (BRC, 2011). The whole process is monitored by the Governance and Strategy Committee of BRC (Kill, 2007).

## **2.4 Motivation and incentives of food producers and/or manufacturers to implement non-regulatory food safety schemes**

Market, political and judicial processes play key roles in the food safety control system of a country (Jayasinghe-Mudalige & Henson, 2007). The market processes work through coordinating firms' business, the political processes work through promulgating and coordinating legitimized institutions, and the judicial processes work through sanctions and dispute mediations (Caswell, Bredahl, & Hooker, 1998; Holleran et al., 1999). Each category of these social processes, however, is subject to failure, namely market failure, policy failure and judicial failure. As a result, individual food firms make every effort, including implementation of both regulatory requirements and non-regulatory schemes, to ensure the expected safety level of their products (Holleran et al., 1999). The motivation and incentives of food firms to implement certain food safety control schemes, for example HACCP and GAP, have been investigated (Fouayzi et al., 2006; Golan et al., 2004; Henson & Holt, 2000; Herath et al., 2007; Hobbs, Fearne, & Spriggs, 2002; Holleran et al., 1999; Jayasinghe-Mudalige & Henson, 2007; Jin & Zhou, 2011; Kleinwechter & Grethe, 2006; Tobin, Thomson, LaBorde, & Radhakrishna, 2013; Wilcock, Ball, & Fajumo, 2011). Only a few reports examine the implementation of non-regulatory food safety schemes (Crandall et al., 2012; Fares & Rouviere, 2010; Karaman et al., 2012; Mensah & Julien, 2011; Noelke & Caswell, 2000; Segerson, 1999; Tomašević et al., 2013; Venturini, 2003). The incentives and motivation for food companies to implement certain food safety schemes can be categorized into three types: (1) market-based incentives, (2) regulatory incentives, and (3) liability incentives (Buzby et al., 2001; Holleran et al., 1999).

## **2.4.1 Conceptual framework to examine the incentives and motivation of firms**

### **2.4.1.1 Market-based model**

Food firms make their decisions to implement certain food safety control schemes based on their perceptions of the costs and benefits of implementation versus non-implementation (Caswell et al., 1998; Fares & Rouviere, 2010). From the supply and demand point of view, the firm's demand curve shifts outwards after the implementation of certain food safety control scheme, which acts as the reward of the market to induce food firms to implement food safety control schemes. However, this will take place only if the consumers are able to identify and assess the risk with respect to the food they buy (Segerson, 1999). The risks of certain food may not be easily and apparently available for consumers (Deaton, 2004) and the costs to assess these risks are likely high (Unnevehr & Jensen, 1999). Deaton (2004) also maintains that the information about food safety is asymmetric among different stakeholders in the food supply chain. As a result, it is argued that markets usually do not work in this regard (Henson & Hooker, 2001). This is the main reason for government intervention and public regulation of food safety to be promulgated (Unnevehr & Jensen, 1999). Theoretically, government intervention raises the firm's marginal costs to produce unsafe food (Hobbs, Spriggs, & Fearne, 2001). Once food firms fail to supply food with the required safety level, they will end up with adverse consequences including juridical sanctions (for example fines, product recall, closure), liability to compensate the victims, loss of reputation and market shares (Buzby et al., 2001). With the government intervention, these adverse consequences are amplified and enforced (Kasperson, Kasperson, Pidgeon, & Slovic, 2003). Thus, it is argued that food firms are

motivated to implement food safety control schemes by 'negative incentives' mentioned above (Buzby et al., 2001).

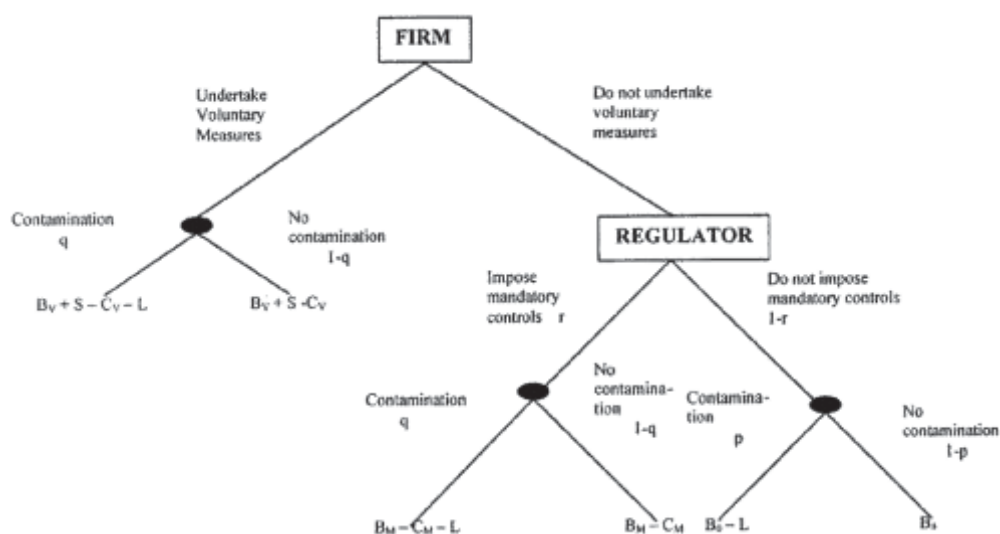
Although it is useful to understand firm-level decisions to enforce food safety management in terms of perceived costs and benefits, firm decision-makers are not always competent to analyse various options and to assess the costs and benefits (Henson, 2008). Costs of food safety management include two types of costs (Hobbs et al., 2001). First is the cost to enforce food safety control, referred to as mitigation costs, such as the cost to implement a certain food safety scheme and to improve production technology. The other type is the cost to deal with food safety problems, referred to as impact cost, including product recall, liability and loss of reputation.

#### **2.4.1.2 Conceptual framework for decision-making to implement non-regulatory food safety scheme**

While the motivation and cost-benefit of compliance with mandatory regulations on food safety have been examined (Henson, 2008; Henson & Holt, 2000; Hobbs et al., 2001; Jayasinghe-Mudalige & Henson, 2007; Romano, Cavicchi, Rocchi, & Stefani, 2005; Wilcock et al., 2011), only a few reports have emphasized the implementation of non-regulatory food safety schemes (Fares & Rouviere, 2010; Noelke & Caswell, 2000; Segerson, 1999; Venturini, 2003). Based on the literature in the implementation of non-regulatory approaches to environmental protection, Segerson (1999) developed a framework to analyse the factors determining whether food firms choose to implement voluntary food safety schemes, assuming that a voluntary scheme is less costly than a mandatory one. Her analytical framework (Figure 2.3) suggested that the food firm's decision to implement voluntary food safety schemes is determined by the

interaction among a number of factors, including (1) the perceived increase in net revenue, (2) the possibility that mandatory regulation will be introduced if a voluntary scheme is not implemented, (3) the difference in cost between voluntary and mandatory implementation, (4) the civil and criminal liability due to supplying unsafe food, and (5) the availability of any subsidies from the government (Segerson, 1999). If it is perceived that there will be no mandatory controls and there are no governmental financial inducements, the firm will implement voluntary food safety controls only if the extra benefits plus the decrease in the expected loss due to supplying unsafe food exceeds the cost to take voluntary measures. On the other hand, the firm will definitely implement voluntary schemes if there is a strong threat of regulation (Segerson, 1999). She also argued that market forces can result in incentives for the implementation of voluntary schemes only if consumers can easily attain the information about the safety of products. However, her framework cannot explain why voluntary food safety schemes have been widely implemented in the fresh fruit and vegetable industry in which there are usually no strong government interventions for food safety (Fouayzi et al., 2006). In addition, it is difficult for the consumer to detect and verify food safety; therefore, food can be referred to credence good (Kher et al., 2013; Venturini, 2003). For credence good, consumers cannot differentiate between a safer good and a less safe one, and hence the demand for a safer good will not increase (Noelke & Caswell, 2000; Venturini, 2003).





**Figure 2.3: Framework for voluntary implementation of food safety schemes**

Note:  $B_V$ - The benefits of voluntary implementation of food safety schemes

$S$ - The amount of subsidy from the government

$C_V$ - The additional costs in order to implement voluntary schemes

$L$  - The expected loss due to supplying unsafe food

$B_M$ - The benefits of compliance to mandatory requirements

$C_M$ - The costs of compliance to mandatory requirements

$B_0$ - The firm's net revenue without implementation of both voluntary and mandatory schemes

Source: Adopted from Segerson (1999)

Following from Segerson's research, Venturini (2003) argues that a strong regulatory propensity is necessary but not sufficient when the cost difference between voluntary and mandatory schemes is not assumed. He suggests that Segerson's assumption about the cost differential is not underpinned by empirical evidence on the implementation of food safety schemes. He also argues that governments should facilitate food firms to differentiate safer food with an official label, then the consumer

can discern safer food. Noelke and Caswell (2000) investigated the motivation to implement a voluntary scheme in the supply chain. According to them, the implementation of voluntary schemes provides higher a level of safety than that of a mandatory or *de facto* mandatory one (required by buyers). They also argue that a rule of negligence induce food firms to implement a quality management system with stricter requirements than a regulation of strict liability. Based on the literature mentioned above, Fare and Rouviere (2010) developed a more practical analytical framework to analyse the implementation of non-regulatory food safety schemes, taking into account the level of safety risk of different food and the involvement of buyers. According to their study, for a food company marketing its products to the consumer directly, non-regulatory schemes will be implemented once there is a strong mandatory threat regardless of whether the level of risk is higher or lower. Under a weak mandatory threat, non-regulatory schemes are more likely to be implemented where the level of risk is lower. When the food firm is a supplier of a certain retailer, incentives or penalties imposed by the retailer will evoke the implementation of non-regulatory schemes regardless of the mandatory threat (Mainville, Zylbersztajn, Farina, & Reardon, 2005). The framework set up by Fare and Rouviere is in a more general context where non-regulatory schemes do not cost less and where the food firm can market either directly to the consumer or through retailers. Although these frameworks can help analyse and understand both public and private motivations for non-regulatory food safety schemes to be implemented by a food company, they all assume that the government will decide to introduce a regulation or not based on the implementation of non-regulatory schemes by food firms. In fact, mandatory regulations have already been introduced by most governments.

#### **2.4.2 Market-based incentives**

Food companies can be driven to implement non-regulatory food safety schemes by market-based incentives which are both internal and external to the companies.

Jayasinghe-Mudalige and Henson (2007) identified seven market-based incentives for red meat and poultry processing companies to enforce food safety management:

finance/cost, human resource efficiency, production efficiency, 'good practice', sales, reputation, and market pressure.

The finance of implementation can be a positive or negative incentive. The costs to implement certain schemes include start-up costs and maintenance costs (Holleran et al., 1999; Jayasinghe-Mudalige & Henson, 2007). On the one hand, the high costs can prevent food firms from implementation. On the other hand, the implementation of these schemes can be cost effective in the long run, because it can decrease the product failure rate and increase firm productivity (Fouayzi et al., 2006; Khatri & Collins, 2007). In addition, transaction costs, which are costs to identify and approve suitable suppliers of raw materials, can be mitigated through the implementation of non-regulatory food safety schemes (Holleran et al., 1999).

According to the study of Jayasinghe-Mudalige and Henson (2007), human resource and production efficiency can be improved when food companies implement enforced food safety controls such as HACCP, however, the effect varies with different sized food companies. During the implementation of the food safety management schemes, the personnel have to be trained and the operation of the business has to be standardized. Then the staff are familiarised with the production process and the management is improved. As a result, the whole business can become more

productive (Holleran et al., 1999). Schemes such as HACCP and GAP are generally recognized as 'good practices' by the industry and the public (Wilcock et al., 2011). Food companies can be motivated to implement these schemes by their desire to be recognized by the industry and the public and to keep their competitiveness in the market.

Once the retailers or wholesalers adopt certain non-regulatory food safety schemes, food companies can be driven to implement these schemes in order to maintain their existing market share or increase that share (Jayasinghe-Mudalige & Henson, 2006; Wilcock et al., 2011). Violaris, Bridges and Bridgees (2008) suggested in their study of Cypriot food companies that customers can persuade food companies to implement HACCP and increase the safety level of food. Motarjemi and Mortimore (2005) also appreciated the important role of buyers in food safety control. Food companies can also reinforce the confidence of the buyers and their reputation in the industry through implementing non-regulatory food safety schemes (Fares & Rouviere, 2010), then they can obtain a competitive advantage and have an impact on the markets for their products.

#### **2.4.3 Regulatory incentives**

Both current and anticipated government regulation can influence food companies to implement non-regulatory schemes. In many cases, non-regulatory schemes provide specified and more flexible ways to meet the requirements laid down by regulations (Henson, 2007; Segerson, 1999). In 1990, the 'due diligence' defence against food safety offenses was introduced into the UK food legislation. Thus suppliers of food including farmers, manufacturers and retailers, must prove that all reasonable

measures are taken to ensure the safety of the food they produce and procure from suppliers (Henson & Holt, 2000). Non-regulatory schemes are reasonable measures to ensure food safety. If there is anticipation that more stringent regulation will be promulgated, food firms may want to be proactive and implement non-regulatory schemes in advance (Fares & Rouviere, 2010; Wilcock et al., 2011), or delay the implementation of non-regulatory schemes in case there are conflicts between these schemes and future regulation.

#### **2.4.4 Liability incentives**

Food safety failure results in liability costs, e.g. fines, product recall, closure and liability to compensate the victims (Buzby et al., 2001). Non-regulatory schemes can provide an additional level of security against food safety failures and non-compliance with regulations (Henson, 2007). The product failure rate can be decreased through the implementation of non-regulatory food safety schemes (Fouayzi et al., 2006). Consequently, food companies can be motivated to implement these schemes by their desire to avoid food safety problems (Khatri & Collins, 2007; Wilcock et al., 2011).

#### **2.4.5 The impact of food firms' characteristics on decision-making**

The costs and benefits of the implementation of certain food safety control systems vary among companies with different characteristics such as size and market (Henson & Holt, 2000; Holleran et al., 1999). Hence, the incentives may have different relative importance when different food companies make decisions to implement certain food safety management schemes (Dora, Kumar, Van Goubergen, Molnar, & Gellynck, 2013; Green & Kane, 2014). According to Hobbs, Fearne and Spriggs (2002), access to the markets of the U. S. and other foreign countries has been one of the important

incentives to induce Canadian meat processors to implement HACCP. It is argued that larger food companies are much more capable of implementing food safety schemes while most small firms do not intend to do so (Jayasinghe-Mudalige & Henson, 2006).

Herath, Hassan and Henson (2007) explored the relationship between firms' characteristics and the implementation of certain food safety schemes in the Canadian food industry. Firm size, sub-sector of the food industry, the nation of ownership and control, innovativeness, the target market and forms of governmental supervision can influence the implementation of food safety schemes such as HACCP, GMP and other non-regulatory schemes. Jin and Zhou (2011) used a logistic model to investigate the association between the attributes of China's agricultural cooperatives and the decision to implement food safety and quality schemes. Their study suggests that the relationship between some cooperative attributes (including size, view and knowledge of food safety schemes, reputation and destination market) and the decision is positive and statistically significant, while the positive effects of other attributes such as innovativeness and government support have not been found.

## **2.5 Effectiveness of non-regulatory food safety management**

Non-regulatory food safety schemes provide systematic approaches to assure that food products meet expected or required specifications at each node in the food supply chain. However, the implementation of a non-regulatory food safety scheme in a food company does not always result in the expected performance of food safety management (Fotopoulos, Kafetzopoulos, & Gotzamani, 2011). The implementation is not merely the introduction of a standard with procedures and practices which have to be abided by. It usually requires the people in the company to change their beliefs and

values (Luning et al., 2006). The performance of a scheme depends on the cumulative effectiveness of controls in the scheme and management practices during the implementation (Dhillon, 2007; Joppen, 2004; Tobias & Trindade, 1998). In practice, the effectiveness of a food safety management system is often unsatisfactory because of unforeseen outcomes in production and /or in behaviours of both managers and production workers (Azanza & Zamora-Luna, 2005; Ball, Wilcock, & Aung, 2009, 2010; Fotopoulos et al., 2009; Van Der Spiegel, Luning, Ziggers, & Jongen, 2004; Wilcock et al., 2011). Some food firms may be a free-rider of a certain non-regulatory scheme, which is another serious issue of effectiveness (Potoski & Prakash, 2009). They change their day-to-day decisions, behaviours and operational practice after going through external audits. They actually cannot comply with all the requirements of the scheme while they still claim that they have implemented a certain scheme.

As most non-regulatory schemes are assessed by independent third-party certification bodies, the quality of audit has an impact on the effectiveness of these schemes (Albersmeier et al., 2009; Jahn et al., 2004b). On the one hand, an objective and reliable audit can assess the implementation of food safety schemes and identify the potential sources of non-compliance, then help food companies to improve their food safety management system continuously (Hatanaka & Busch, 2008; Tanner, 2000). On the other hand, an audit which is not objective and reliable will not be able to disclose the non-compliances of the food company, and the food safety schemes cannot be implemented effectively.

### **2.5.1 Firm-level critical factors affecting the effective implementation of non-regulatory food safety schemes**

In research on the implementation of advanced technologies, it has been found that it is most difficult to change the organisation and people (Luning et al., 2006). A myriad of researchers have suggested several factors that might have an influence on the effectiveness of HACCP (Azanza & Zamora-Luna, 2005; Ball et al., 2010; Bas, Yuksel, & Cavusoglu, 2007; Eves & Dervisi, 2005; Fotopoulos et al., 2009; Jevšnik, Hlebec, & Raspor, 2006; Ramirez Vela & Martín Fernández, 2003; Walker, Pritchard, & Forsythe, 2003). These factors are two-fold: company related and employee related.

#### **2.5.1.1 Company related factors**

The company related factors include top management commitment, infrastructure, human resource management (including training, supervision and communication) and food safety culture (Ball et al., 2009; Fotopoulos et al., 2009; CJ Griffith, KM Livesey, & DA Clayton, 2010b; Douglas A. Powell, Jacob, & Chapman, 2011; Sarter & Sarter, 2012). According to Mensah and Julien (2011), top management commitment is the most highly ranked successful implementation factor of food safety management. Top management commitment can ensure acceptance and enough support such as financial investment to implement a food safety management scheme. Infrastructure is also important for a company to implement HACCP effectively (Azanza & Zamora-Luna, 2005; Bas et al., 2007; Clayton, Griffith, Price, & Peters, 2002; Nieto-Montenegro, Brown, & LaBorde, 2006). The equipment should be maintained properly and verified that it is in the right working condition. It is very difficult for workers to follow food safety procedures without suitable and sufficient equipment and facilities (Ball et al., 2009, 2010). Ball, Wilcock and Aung (2009) found that employee supervision could



reinforce food safety behaviours of workers and that the performance of workers could be strengthened by giving them positive feedback. Communication among all personnel is critical for food safety management to enforce the workers' awareness of the importance and benefits to follow the requirements of HACCP (Wilcock et al., 2011). Training can provide the personnel with essential skills and knowledge to follow the requirements of food safety management effectively (Fotopoulos et al., 2009).

A food safety culture can fundamentally impact the day-to-day decisions, behaviours and practices that help to effectively implement a food safety management system (Abidin, Arendt, & Strohbehn, 2013; Seward, Dobmeier, & Baron, 2012; M. Wright & Leach, 2013). It is a component of the organisational culture in a food business, and is the way in which a food business and its employees deal with and value food safety, including the basic assumption and belief of food safety. The food safety culture of a food business should be taken into consideration as a risk factor when a foodborne outbreak takes place (Griffith et al., 2010b). Powell, Jacob and Chapman (2011) suggested the possibility that failures in food safety culture could result in foodborne illness outbreaks. An independent review, issued by the Canadian government, revealed that the weak food safety culture in XF Foods Inc. led to the massive beef recall in Canada and the US in 2012 (Lewis, Corriveau, & Osborne, 2013). The independent investigation panel found that both plant staff and Canadian Food Inspection Agency (CFIA) officials on site did not always meet their responsibilities towards food safety regulations.

#### **2.5.1.2 Employee related factors**

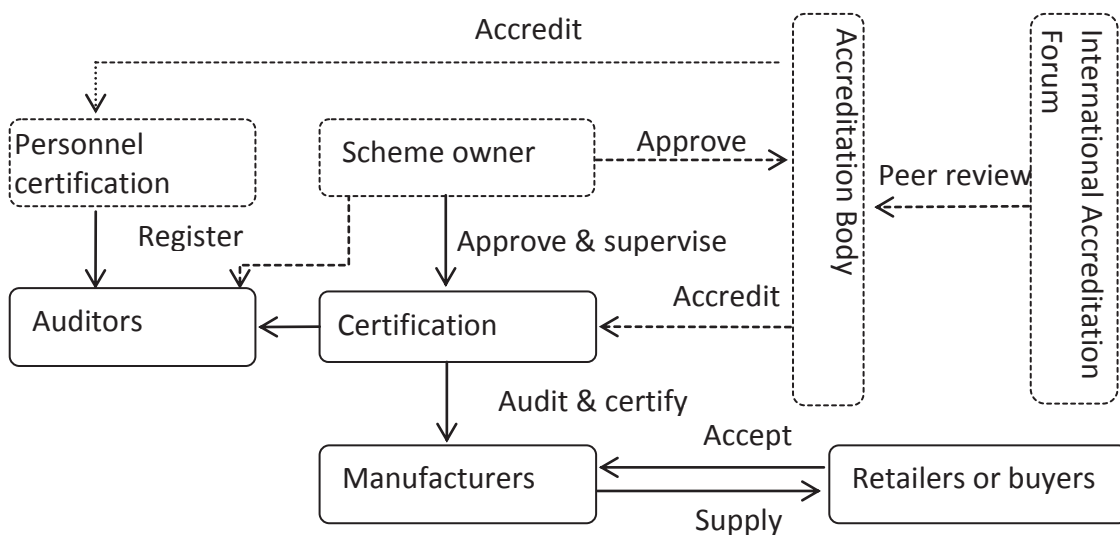
The employee related factors include knowledge and skill, attitude and commitment to food safety. In the study of Fotopoulos, Kafetzopoulos and Psomas (2009), employee's knowledge and commitment are highly ranked as critical factors for effective implementation of HACCP. Vela and Fernandez (2003) also found that employees' lack of knowledge could result in insufficient hazard analysis and that problems of attitude inhibited any change in behaviour. Some studies suggest that involving workers in developing food safety procedures is important (Mortimore, 2001; Wilcock et al., 2011).

#### **2.5.2 The quality of audit or inspection**

##### **2.5.2.1 Third-party certification bodies and non-regulatory food safety schemes**

Third-party certification bodies have played an important role in the verification and assessment of most non-regulatory food safety schemes through their business of certification and supply chain audits (Hatanaka et al., 2005). The third-party is an independent person or body that is not connected with the person or organisation that provides products or services (first party), and has no user interests in those products or services (second party). According to ISO/IEC (2004, p. 14), certification is "third-party attestation related to products, processes, systems or persons". A certification body is a third-party that conducts certification activities, such as audit and inspection, and issues the certificate to producers and other organisations (ISO/IEC, 2004). Figure 2.4 illustrates the relationships among different stakeholders in relation to the non-regulatory food safety scheme involving third-party certification. Scheme owners can be a government agency or the private sector. Generally, there is a national accreditation body (AB) in most countries. Most ABs are members of the International

Accreditation Forum (IAF), which is the world association of conformity assessment accreditation Bodies (Hatanaka & Busch, 2008), and are thoroughly peer reviewed by IAF. Some stakeholders are not involved in certain non-regulatory FSMS, such as scheme owners, accreditation bodies and IAF. These stakeholders are in dotted text boxes in Figure 2.4. In the case of ISO 22000, there is no scheme owner. Without any approval or registration, certification bodies can offer the service of ISO 22000 certification once they hire enough competent auditors. Meanwhile, they often seek accreditation to demonstrate their independence and objectivity to stakeholders (D. A. Powell et al., 2013).



**Figure 2.4: System of the non-regulatory food safety scheme involving third-party certification**

### 2.5.2.2 The quality of audit or inspection

The independence and objectiveness of third-party certification bodies and the reliability of third-party certification are of concern (Albersmeier et al., 2009; Hatanaka & Busch, 2008). The quality of audits carried out by third parties has also been

questioned (Albersmeier et al., 2009; Albersmeier, Schulze, & Spiller, 2010; Anders et al., 2010; Holger et al., 2006; Jahn et al., 2004a; Karapetrovic & Willborn, 2000; D. A. Powell et al., 2013).

As illustrated in Figure 2.4, third-party certification bodies are independent from other stakeholders in the system, such as retailers and suppliers. However, Hatanaka and Busch (2008) argue that third-party certification bodies are organisationally but not operationally objective and independent, and that they are involved in a social, political and economic contexts. As the audit and certification market is fierce (Anders et al., 2010), it is very difficult for third-party certification bodies to operate as completely independent actors in the global food supply chain. They have to make profits and survive. Hence, they may strive to minimise their audit time to decrease costs (Albersmeier et al., 2009) and may not consider their audit result (Hatanaka & Busch, 2008). Without supervision or a regulatory system, certification bodies may risk a superficial audit (Davey & Richards, 2013). For most non-regulatory food safety schemes, food companies are free to choose the certification body and even can change it at any time. Consequently, certification bodies can become dependent on their clients (food companies). They may sign contracts with their clients with a special term or auditing fee, which is known as 'low-balling'. In order to get the contract, certification bodies sharply decrease the fee for the first audit and try to make profits from an on-going relationship, namely the annual fee for subsequent audits (Anders et al., 2010). Since the annual audit fee depends on customer loyalty, it is a quasi-rent. Low-balling marketing lets certification bodies become dependent on their clients (Makkawi & Schick, 2003). Furthermore, it is also difficult for certification bodies to ensure that all auditors pursue the same objectives and comply with requirements of

certification bodies. In fact, auditors could maximise their own income through undesirable means such as accepting bribery from the companies they audit (Pechlivanos, 2005).

After the investigation of the outbreak of *Listeria monocytogenes* in cantaloupe in 2011, the Committee on Energy and Commerce of the U.S. House of Representatives wrote a letter to the Commissioner of the FDA (Committee on Energy and Commerce, 2011). Several failures were identified in the third-party audit system related to this outbreak. When Jensen Farms, the cantaloupe grower and packer, was audited by a third-party, the auditor did not emphasize the non-compliances to FDA guidance. The auditor also did not track the identified non-compliances to assure that they had been corrected, and did not report those issues to the FDA or any other food safety authorities. A notice of each audit was provided to Jensen Farms in two-week or one-month advance. The time spent on site during auditing was far from enough to discover potential non-compliances. Potential conflicts of interest have also been found between the third-party auditors and Jensen Farms.

In carrying out auditing activities, auditors should objectively and independently collect and validate audit evidence, assess it against standards of the food safety schemes, and summarise and reveal their findings (Karapetrovic & Willborn, 2000; D. A. Powell et al., 2013). The assurance of audit quality relies mainly on the correct qualification and ability of auditors, compliance with the audit guideline issued by ISO or IAF, and the conformity assessment of accreditation performed by accreditation bodies (Jahn et al., 2004b; Karapetrovic & Willborn, 2000). In some countries such as China, government agencies are also involved in the control of audit quality (Song, Gao,

Liu, & Nanseki, 2010; Xie, Li, & Qian, 2011) according to the Regulations of the People's Republic of China on Certification and Accreditation (Decree No. 390 of China's State Council). The audit system effectiveness is the probability that the audit system will attain a set objective in a given period of time, when it is working in certain conditions and context. Jahn, Schramm and Spiller (2005) developed a model to analyse the audit quality, the marginal cost of a more effective audit and the cost of a deficient audit. Their model shows four approaches to increase the quality of an audit: increasing the liability of the certification body, appreciating the effects of reputation in the certification and audit market, reducing the dependence of the certification body on specific clients, and decreasing the audit cost through the application of more efficient audit technology.

## **2.6 Conclusions**

As an imperative public health issue, food safety has drawn great concern from government agencies, NGOs, the public, the food industry and other stakeholders. The changes in the food supply chain, society and environment have added extra complexity to this issue. Food safety management should be a shared responsibility among all stakeholders. Non-regulatory food safety management schemes, as an alternative to mandatory regulation, have become a much more prevalent component of the food safety control system of the global food supply chain. There are three forms of these schemes: individual company schemes, collective national schemes, and collective international schemes. An operational scheme should have five essential functions: standard-setting, adoption, implementation, conformity assessment and enforcement.

Researchers have investigated the implementation of certain non-regulatory food safety management schemes, for example HACCP and GAP. In the literature, the incentives and motivation for food companies to implement certain non-regulatory food safety schemes can be categorized into three types: market-based incentives, regulatory incentives, and liability incentives. However, there is little information on the efficacy of these non-regulatory schemes alongside other food safety management systems and the motivations of food enterprises to implement these kinds of schemes.

Despite non-regulatory food safety schemes providing systematic approaches to assure that food products meet expected or required specifications at any node in the food supply chain, the implementation of a non-regulatory food safety scheme in a food company does not always result in an improvement in food safety management. The effectiveness of a food safety management system is often unsatisfactory because of unforeseen outcomes in production and /or in behaviours of both managers and production workers. Both company and employee related factors can influence the effectiveness of any food safety management system.

As most non-regulatory schemes are audited or assessed by independent third-party certification bodies, the quality of audit can have an impact on the effectiveness of these schemes (either positive or negative). The quality of audits carried out by third parties has been questioned. The factors which can influence the audit quality need to be examined.

Based on this literature review and my working experience in the third-party certification industry, three research hypotheses were formulated.

Hypothesis 1. The characteristics of food businesses influence their experiences of the implementation of non-regulatory food safety management schemes.

Hypothesis 2. The more mandatory regulations that are involved in food safety management, the fewer the food businesses that will implement non-regulatory food safety management schemes.

Hypothesis 3. The corporate culture of food businesses and the quality of third-party food safety audits influence the effectiveness of non-regulatory food safety management schemes.





## **CHAPTER 3 RESEARCH METHODOLOGY**

### **3.1 Introduction**

This chapter details the methods used in this study. In order to answer the research questions, this study was carried out in the food manufacturing and the third-party certification service sector in New Zealand. Three methods were used to collect research data on non-regulatory food safety management in New Zealand: (1) document analysis, (2) questionnaire surveys, and (3) case studies. Each method is explained in detail in the following sections. Data analysis and limitations of this study are also discussed.

### **3.2 Document analysis**

The document analysis covered documents of non-regulatory food safety management scheme (FSMS) owners, the International Standardisation Organisation (ISO), certification bodies, the accreditation body, and the personnel certification body. Specifically, documents of the scheme owners included standards, requirements of certification bodies, requirements of auditors, and other openly accessible documents. Documents of certification bodies were obtained from their websites. Documents of the accreditation body consisted of procedures and policies in relation with the accreditation of non-regulatory FSMS. In New Zealand, the Joint Accreditation System of Australia and New Zealand (JAS-ANZ) is the accreditation body authorized by the government to provide an accreditation service to certification bodies. Non-regulatory food safety management standards and guides issued by ISO were included in the document content analysis. Documents of the personnel certification body were obtained from their website with respect to the certification of non-regulatory FSMS

auditors. These documents were reviewed and analysed qualitatively. Key elements of different standards of non-regulatory FSMS were identified and compared. The requirements for certification bodies and auditors were categorised. Together with the literature review, this analysis formed the basis for understanding the structures and procedures of non-regulatory FSMS.

### **3.3 Questionnaire survey**

The Tailored Design Method protocol (Dillman, Smyth, & Christian, 2009) was applied to the development and administration of the questionnaire survey, so as to maximise the reliability and response rate.

#### **3.3.1 Questionnaire design**

Two structured questionnaires were designed, one for food manufacturing enterprises and one for third-party certification bodies. Their content derived from the document analysis and the systematic literature review in Chapter 2, which covered the motivation of, costs and benefits of, challenges to, effectiveness of the implementation of food safety management schemes, and third-party audits. In addition, the typical features of the New Zealand food industry were taken into consideration.

There were four parts and 33 questions in the questionnaire for food manufacturing enterprises (see Appendix B for details). Part I focused on the implementation of non-regulatory FSMS in New Zealand. It covered the current non-regulatory food safety management schemes, incentives/motivation to implement, challenges and how to overcome challenges to the implementation, factors affecting the effectiveness, costs of implementing, and the changes in relation to food quality and safety management,

market performance, production cost and the relationship with customers as a consequence of the implementation of non-regulatory FSMS. Part II investigated the experience with regulatory food safety schemes required by the New Zealand Government. Part III explored food safety culture in the food manufacturing industry in New Zealand. Part IV concerned the characteristics of the food manufacturing enterprises: sub-sector, size in terms of current number of employees, business type, target market, and respondent details (e.g. position, name, and contact information).

The questionnaire for third-party certification bodies consisted of 22 questions (see Appendix C for details). It focused on exploring their perspectives on the benefits of implementing a non-regulatory FSMS and the factors affecting their effectiveness, as well as factors that have an impact on the quality of an audit or inspection.

A section was included in both questionnaires to collect detailed contact information of companies and certification bodies which were willing to take part in further research (case study). This section was optional for the respondent, and provided the direct contact information of food safety managers or auditors enabling a detailed further investigation to be carried out using interviews.

All questions were asked in a clear and unambiguous way. Double-barrelled questions, negative items, long items, biased items and terms were avoided. Instructions on how to fill out the questionnaires were provided. After certain questions, there was a brief introduction in bold type explaining what to do. Questionnaires were pre-tested. They were reviewed by several food safety specialists, and pre-tested with several food safety managers and auditors. Both questionnaires were visually designed in an academic style, and were bound as booklets. An online version was created for each

questionnaire via Qualtrics Online Survey Software ([www.qualtrics.com](http://www.qualtrics.com)). Links to the online version were included in the instructions on how to fill out the questionnaire. In this way, a respondent could fill out the hard copy of the questionnaire, or fill it out online.

### **3.3.2 Target population and sample**

The target population was food manufacturing enterprises and third-party certification bodies in New Zealand. As a full list of food manufacturing enterprises in New Zealand was not available, a list of 419 food or beverage manufacturers was compiled from the Food and Beverage Information Project administered by the Ministry of Business, Innovation & Employment, and the Ministry for Primary Industries (MPI) register of risk management programme (RMP) and food safety programme (FSP). The Food and Beverage Information Project aims at providing a comprehensive overview of the food and beverage industry in New Zealand. The Food and Beverage directory (<http://directory.foodandbeverage.govt.nz/>) is part of this project, and is supported by the Kompass database. It contains comprehensive information on over 1,000 companies in the food and beverage sector. The list of certification bodies was obtained from the website of JAS-ANZ ([www.jas-anz.com.au](http://www.jas-anz.com.au)). There were thirteen certification bodies which provide a food safety audit/inspection service and have office(s) in New Zealand when this study was conducted.

### **3.3.3 Survey administration**

The two questionnaires were mailed out to 419 food and beverage manufacturing enterprises and 13 third-party certification bodies on 1<sup>st</sup> August 2012. A cover letter under Massey University letterhead was included in the mail package. It was signed by

both the author and main supervisor. In this way, an additional incentive was provided to encourage more responses (Dillman et al., 2009). It explained the purpose and aims of the questionnaire survey, and a statement of the low ethical risk of the research project was included. It also mentioned that questionnaires were to be completed by food safety or quality managers of food businesses and food safety certification managers of third-party certification bodies. For details of the cover letters for the food manufacturing enterprises and certification bodies, see Appendix B and C respectively. Two options were provided to the participants. Respondents could fill out the questionnaire and post it back, or alternatively fill it out online via Qualtrics Online Survey Software. A reminder letter was sent out to 355 food manufacturing enterprises and seven certification bodies that had not yet responded on 22<sup>nd</sup> August 2012.

For the survey of food manufacturing enterprises, fifteen questionnaires failed to be delivered due to a wrong address. Eight food businesses indicated they would not take part in this survey. One respondent said they had shut down their plant. The total number of responses was 115, a response rate of 28.5%. Only eighteen respondents filled out the questionnaire online. The response rate is comparable to those of previous studies in the field of food quality and safety management, e.g. 26% (120 responses) in the UK (Mensah & Julien, 2011), 12.8% (134 responses) (Herath & Henson, 2010) and 30.5% (279 responses) (Jayasinghe-Mudalige & Henson, 2006) in Canada, 14% (38 responses) in the US (Fouayzi et al., 2006).

For the survey among third-party certification bodies, seven certification bodies sent the questionnaires back, a response rate of 54%.

### **3.4 Case studies**

A detailed investigation into the implementation of certain schemes cannot be obtained only through a questionnaire survey, although a sample can be used to estimate the characteristics of the target population (D. Wright, 1997). Case studies were used to make up for the limitations of the questionnaire survey (Yin, 2009). Case studies were also carried out through the telephone interview complementing questionnaire survey when the food safety management certification was investigated in the food manufacturing industry in the UK (Mensah & Julien, 2011). A semi-structured interview script was used to obtain further details beyond those given in the survey. Questions were standardised in order to increase the consistency of interviews. For details of interview questions, see Appendix D. The feedback received from the interviews was transcribed verbatim and analysed.

Nineteen food manufacturing enterprises indicated that they were willing to take part in further research. Five respondents were chosen for telephone interviews, which covered food manufacturing enterprises with different characteristics (Table 3.1). Three responding certification bodies indicated that they were willing to take part in further research. One was chosen for interview, from which both an auditor and a certification service manager were interviewed.

**Table 3.1: Characteristics of interviewees (food manufacturing enterprises)**

Characteristics of enterprise	No. of interviewees
<b>Sub-sector</b>	
-Animal products	2
-Vegetal products	1
- Products with long shelf life at ambient temperature	2
<b>Size</b>	
-Micro	1
-Small	1
-Medium	2
-Large	1
<b>Exporting status</b>	
-Export	3
-Domestic market only	2

### **3.5 Research ethics**

A screening questionnaire for research ethics was filled out. This study was evaluated by peer review and judged to be of low risk. Consequently, it has not been reviewed by the Human Ethics Committees of Massey University. However, a low risk notification was obtained from the Human Ethics Committees, and the committee have recorded this study on the Low Risk Database.

### **3.6 Data analysis**

Research data collected through the two questionnaire surveys were managed and analysed using IBM SPSS Statistics 20.0.



### **3.6.1 Frequency**

The FREQUENCIES operation was used first for responses to each question. Through the frequency analysis, all data entry errors were identified, and the distribution of responses and mean values for certain questions were determined.

### **3.6.2 Cross-Tabulations**

Cross-Tabulation analysis was carried out to examine the association between the propensity of respondents to implement non-regulatory FSMS and the enterprise attributes (Chapter 5), the impacts of enterprise attributes on the experiences of non-regulatory FSMS (Chapter 6), and the influence of enterprise attributes on responses to statements about food safety culture (Chapter 8).

Chi-square was used to identify the significance of these associations. Phi was used to examine the strength of the association between two nominal variables, being appropriate for 2×2 tables (Healey, 2012). Gamma (G) was used to examine the strength of the association between two ordinal level variables (Healey, 2012).

### **3.6.3 Binary Logistic Regression**

Binary Logistic Regression was performed to examine the quantitative impacts of the enterprise characteristics on the decision of food manufacturing enterprises to implement non-regulatory FSMS (Chapter 5). Binary Logistic Regression is a kind of logistic multiple regression which can predict the value of a binary variable from a group of independent variables. It identifies how strongly each independent variable is associated with the probability that the binary variable falls in a particular category (Cramer, 2003).

## **CHAPTER 4 IMPLEMENTATION OF NON-REGULATORY FOOD SAFETY**

### **MANAGEMENT SCHEMES IN NEW ZEALAND**

#### **4.1 Introduction**

The safety of food should be a non-negotiable priority for food manufacturers and food safety regulating authorities. Although thousands of people have been employed and engaged in food safety management around the world, with millions of dollars invested in food safety research and management and a myriad of inspections/audits and tests conducted by governmental agencies and non-governmental organisations (NGOs) at home and abroad, food safety still remains an issue of paramount importance and public health priority (Yiannas, 2009).

In response to increasing concern about food safety in the past 20 years, international organisations, governments, non-government organisations, retailers, and producer associations have introduced a large number of food safety management regulations, guidelines, standards and specifications to regulate and assure food safety (Da Cruz et al., 2006; Henson, 2007; Luning et al., 2006; Neeliah & Goburdhun, 2007; Trienekens & Zuurbier, 2008). Some of them are compulsory requirements for food enterprises (such as government regulations), while others are not. Those schemes which are not mandatory requirements from governments are defined as non-regulatory schemes in this study whether they are owned by governmental agencies, non-government organisations or the private sector.

For food businesses, most non-regulatory food safety management schemes (FSMS) are voluntary; however, they often become de facto mandatory in a business sense because they are adopted by dominant market players in the food supply chain

(Henson, 2011), although food businesses are only obliged to implement those schemes if they want to supply product to those customers. For example, the British Retail Consortium (BRC) Global Standard for Food Safety was originally set by a trade entity in the UK and has been adopted by retailers in the UK. Food enterprises have to implement the BRC Global Standard for Food Safety in order to keep or gain supplying contracts with retailers in the UK. Non-regulatory FSMS, as a complement or alternative to mandatory regulation, have become a much more prevalent component of the food safety control system of the global food supply chain.

A number of studies have investigated the incentives for, costs and benefits of, and challenges to food businesses to conform to food safety regulations in many countries. Some non-regulatory FSMS have been examined in the UK (Mensah & Julien, 2011), the USA (Fouayzi et al., 2006), China (Zhou et al., 2011) and other countries (Hassan et al., 2006; Karaman et al., 2012; Tomašević et al., 2013). To my knowledge, there are no reports on the implementation of non-regulatory FSMS in the context of the New Zealand food and beverage manufacturing industry.

This chapter focuses on the results of the survey and case studies among food manufacturing enterprises. It first details the profile of respondents to the survey, non-regulatory FSMS implemented in New Zealand, and the implementation process of non-regulatory FSMS. It then investigates incentives for, challenges to, and changes after the implementation of these non-regulatory FSMS. Finally, it explores the factors influencing the effectiveness of non-regulatory FSMS, costs, and the role of third-party certification bodies in the implementation of these non-regulatory FSMS, followed by a discussion and chapter conclusion.

## 4.2 Profile of respondents to the survey

Based on the small and medium-sized enterprise (SME) definition of the New Zealand Centre for Research into Small and Medium-Sized Enterprises, approximately 78% of respondents belonged to the SMEs category (Table 4.1). Registered limited liability companies accounted for more than 83% of respondents. Respondents covered most sub-sectors of the food and beverage industry in New Zealand (Figure 4.1). One respondent may be in several sub-sectors. 62.3% of all respondents supplied an overseas market, including Australia, Europe, the USA, Asia and others (Table 4.2).

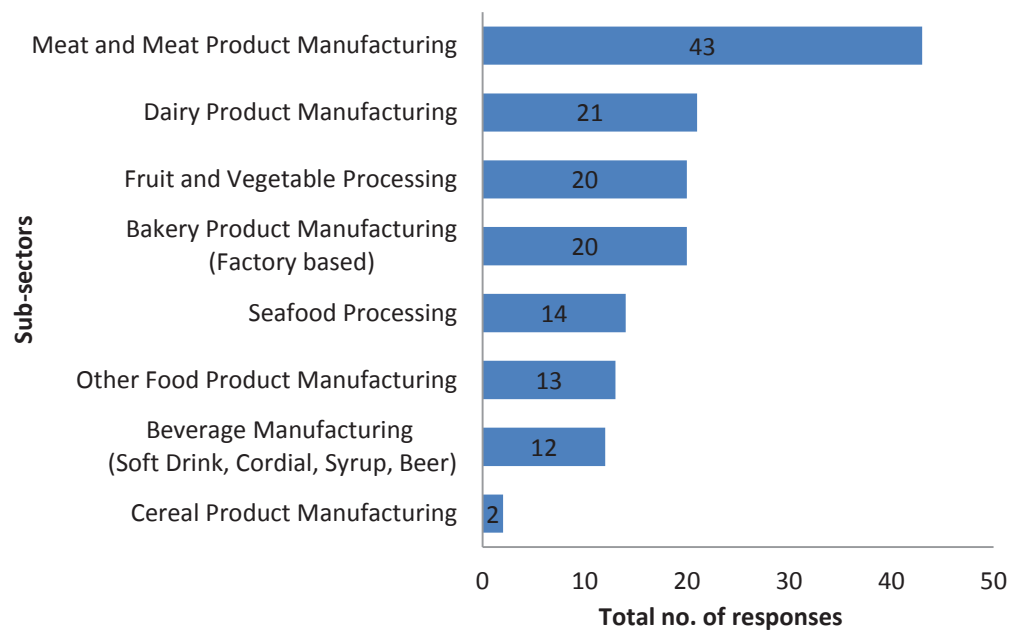
**Table 4.1: Size of food and beverage manufacturing enterprises**

	<b>Micro</b>	<b>Small</b>	<b>Medium</b>	<b>Large</b>
<b>No. of full time employees (N)</b>	N≤5	5<N<50	50≤N<100	N≥100
<b>Total no. of responses</b>	13	64	12	25
<b>% of respondents</b>	11.4	56.1	10.5	21.9

Note: One respondent did not indicate its size in term of number of employees.

**Table 4.2: Overseas market of respondents**

<b>Overseas market</b>	<b>Total no. of responses</b>	<b>Average % of overall sales</b>
<b>Australia</b>	43	23.4
<b>Europe</b>	18	16.3
<b>USA</b>	20	30.3
<b>Asia</b>	32	27.4
<b>Others</b>	16	8.2

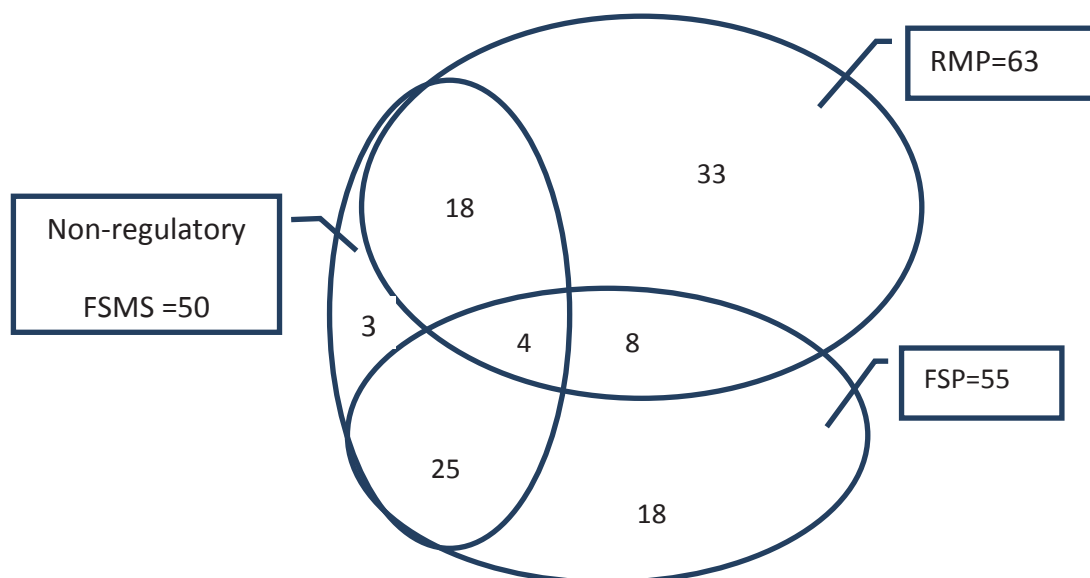


**Figure 4.1: Sub-sectors of food and beverage manufacturing enterprises**

Note: One respondent may cover more than one sub-sector.

#### 4.3 Food safety management systems

The majority of respondents had a regulatory or non-regulatory food safety management system in place. Five manufacturing enterprises did not have non-regulatory or regulatory FSMS in place. 43.5% of enterprises had at least one third-party audited non-regulatory FSMS implemented. Approximately 40% of enterprises had both non-regulatory and regulatory food safety management systems in place (Figure 4.2).



**Figure 4.2: Food safety management systems**

#### **4.4 Non-regulatory FSMS implemented by food and beverage industry in New Zealand**

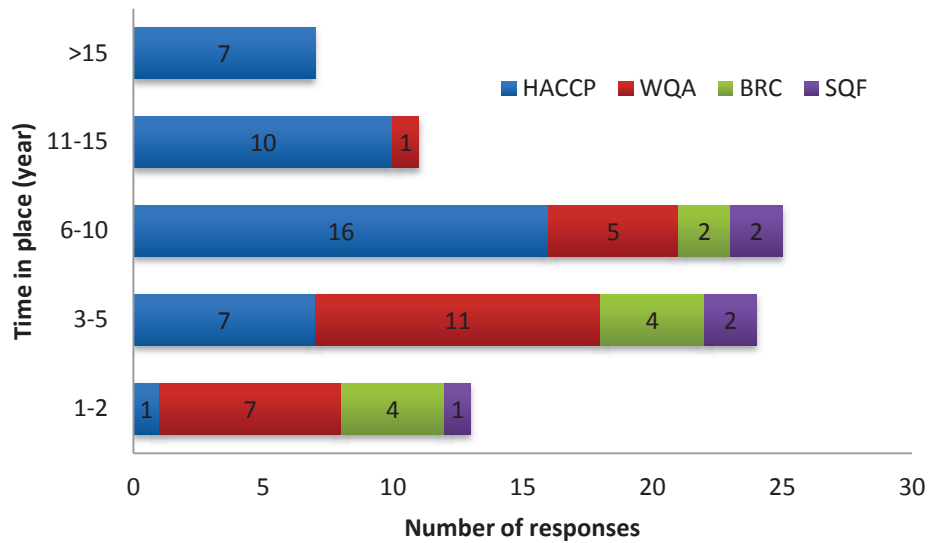
Among respondents, seventeen non-regulatory food safety management schemes have been implemented by food and beverage manufacturing enterprises. These schemes can be categorized into three groups: public international standard schemes, public industry sector schemes, and private individual firm schemes (Table 4.3). A total of 45 enterprises have implemented public international standard schemes which include Hazard Analysis and Critical Control Point (HACCP) and ISO 22000 Food Safety Management System (ISO 22000). HACCP is regarded as a food safety management system instead of a tool for developing a food safety system in this study. It was stated explicitly in the questionnaire. A total of 18 enterprises have public industry schemes in place, including the British Retail Consortium (BRC) Global Standard for Food Safety, Safe Quality Food (SQF) Programme and Food Safety System Certification (FSSC) 22000. International Featured Standards Food (IFS Food), which has been implemented in Asia and European countries, hasn't been implemented by all respondents. A total of 34

respondents have been certified or audited against private individual firm schemes which include Woolworths Quality Assurance (WQA) and other Approved Supplier Programmes such as Burger King Standard, Subway Global Food Standard, Yum! Brands Global Restaurants, McDonald's Supplier Quality Management System, Wholefoods, TESCO Food Manufacturing Standard, Waitrose, Marks & Spencer, COLES and ALDI.

**Table 4.3: Non-regulatory food safety management schemes**

<b>Category of schemes</b>	<b>Name of schemes</b>	<b>Total no. of responses</b>	<b>% of respondents</b>
<b>Public international standard scheme</b>	HACCP	42	36.5
	ISO 22000	3	2.6
<b>Public industry sector scheme</b>	BRC	11	9.6
	SQF	6	5.3
	FSSC 22000	1	0.9
<b>Private individual firm schemes</b>	WQA	26	22.6
	Other approved supplier programmes	8	7.0

Figure 4.3 illustrates the distribution of respondents according to the time in place of non-regulatory FSMS widely implemented by respondents. The average time HACCP has been in place is around 10 years. The majority of respondents had HACCP in place more than 5 years, and the longest is 24 years. As for WQA, average time in place is 4 years, and most of respondents had it less than 5 years. The average time in place for BRC and SQF are about 4 and 5 years respectively.



**Figure 4.3: Time major non-regulatory FSMSs in place**

#### **4.5 Implementation process of non-regulatory FSMS**

Although detailed requirements have been outlined in each non-regulatory FSMS, food businesses have to develop and implement their enterprises' specific food safety management system so as to meet those requirements. The process of development and implementation takes time and financial resources.

##### **4.5.1 Development of FSMS**

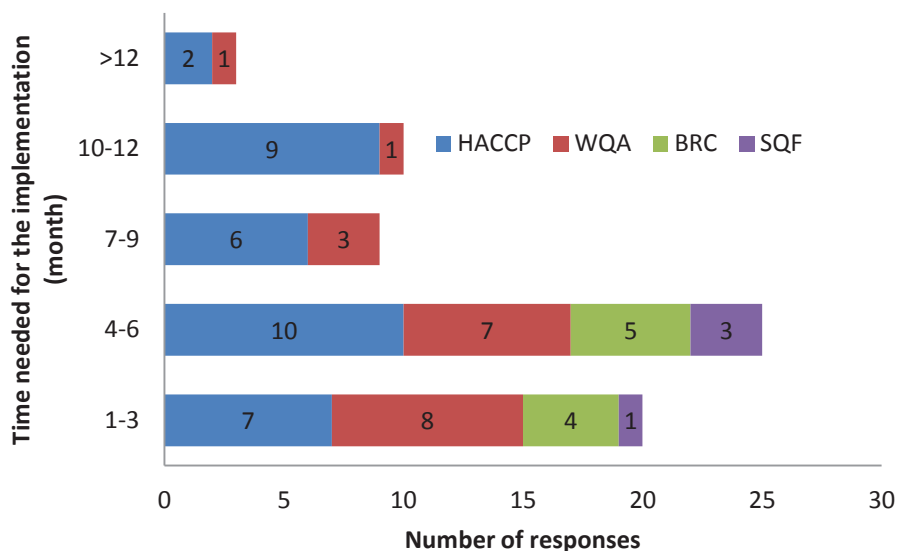
Food and beverage manufacturing enterprises have up to 4 options to choose when they develop and implement those non-regulatory FSMS: own employees, hiring one or more consultants, own employees and consultant(s), and using templates or models provided by government agencies or industry associations. According to the survey, about half of respondents developed their non-regulatory FSMS in-house, which is different from the situation in the UK where 77% developed their FSMS in-house (Mensah & Julien, 2011). A total of 25% indicated their FSMS were developed jointly by both their own employees and consultants. A total of 18.8% of respondents outsourced the development to a consultant. This is also quite different from the



situation in the UK where 2% were completely developed by consultant(s). Only 10% of respondents claimed that templates were used.

#### 4.5.2 Time needed for the implementation

On average, it took more than 9 months for enterprises to implement HACCP before getting a successful audit/inspection carried out by a third-party CB. One respondent spent 60 months to implement HACCP before a successful audit or inspection, while the majority of respondents spent less than 12 months (Figure 4.4). This is similar to the findings in China (Bai, Ma, Yang, Zhao, & Gong, 2007), Serbia (Tomašević et al., 2013) and Australia (Khatri & Collins, 2007) where the majority of respondents claimed it took 6-12 months. The average implementation times for WQA, BRC and SQF are 6, 4 and 5 months respectively, all of which are less than that for HACCP. According to the respondents, schemes such as WQA and BRC were implemented after first implementing HACCP or the regulatory systems; hence it took less time to implement them.



**Figure 4.4: Major non-regulatory FSMs implementation time**

#### **4.6 Motivation and incentives for food manufacturers to implement non-regulatory FSMS**

To assess the importance of different incentives for food and beverage manufacturing enterprises to implement non-regulatory FSMS, respondents were asked to rate the importance of 14 different items based on the reasons their enterprises have for their implementation on a 4-point Likert scale where 1=very important and 4= unimportant. The mean rate for each incentive is reported in Table 4.4.

Meeting the requirements of major customers was identified by respondents as the primary incentive to implement the non-regulatory FSMS. The same has been found in the USA where food companies were primarily motivated by customers' requirements to implement schemes like BRC and SQF (Crandall et al., 2012). Violaris, Bridges and Brideges (2008) suggested in their study of Cypriot food companies that customers could persuade food companies to implement HACCP and increase the safety level of food. Motarjemi and Mortimore (2005) also appreciated the important role of buyers in the food safety control. Once the retailers or wholesalers adopt certain non-regulatory food safety schemes, food companies can be driven to implement these schemes in order to gain market access (Wilcock et al., 2011). In New Zealand, food and beverage manufacturing enterprises have to implement WQA and be audited by external auditors every six months if they supply to Progressive Enterprises which owns 164 Countdown supermarkets. The same was found in the UK, where 76% of respondents were driven by customer requirements to get certified against standards such as BRC and ISO 22000 (Mensah & Julien, 2011). One respondent of this study commented that his company withdrew the BRC certificate in 2011 as no customers required it.

Improving product quality and safety was the second most important incentive indicated by respondents. This is different from the findings in the UK, where product safety improvement was the most important motivation (Mensah & Julien, 2011). It is also an important driver for the food enterprises to enforce food safety management in Serbia (Tomašević et al., 2013) and China (Jin, Zhou, & Ye, 2008). “Generally regarded as good practices” was recognised by respondents as another important incentive. The same was found in Canada, where food companies were motivated to implement these schemes by their desire to be recognized by the industry and the public (Wilcock et al., 2011).

**Table 4.4: The importance of different incentives**

Incentives	% rate 1	% rate 2	% rate 3	% rate 4	% rate 0	Mean
Meeting major customers' requirements	97.9	2.1	0	0	0	1.02
Improving product quality and safety	58.3	25.0	4.2	12.5	0	1.71
Generally regarded as good practice	39.6	45.8	6.3	8.3	0	1.83
Enhancing marketing advantages	37.5	37.5	20.8	4.2	0	1.92
Attracting new customers	39.6	37.5	14.6	8.3	0	1.92
Access to new overseas markets	52.1	18.8	12.5	16.7	0	1.94
Reducing the likelihood of liability claims	29.2	45.8	16.7	6.3	2.1	2.00
Meeting regulatory requirements in a cost-effective way	39.6	31.3	12.5	14.6	2.1	2.02
Improving production efficiency	31.3	33.30	16.7	18.8	0	2.23
Improved corporate image	25.0	33.3	27.1	14.6	0	2.31
Reducing quality audits by customers	29.2	31.3	14.6	22.9	2.1	2.32
Meeting the requirements of insurance	16.7	29.2	31.3	20.8	2.1	2.57
Competitors are certified	22.9	27.1	22.9	27.1	0	2.54
Prospect of operational cost reductions	18.8	33.3	12.5	35.4	0	2.65

Note: 1 - very important, 2 – somewhat important, 3 – slightly important, 4 – unimportant, 0 – don't know

#### **4.7 Changes as a consequence of the implementation of non-regulatory FSMS**

In practice, the performance of the non-regulatory FSMS is variable; the implementation may result in different changes in food businesses. This study investigated the changes in relation to food quality and safety management, market performance, production cost and the relationship with customers as a consequence of the implementation of non-regulatory FSMS. Respondents were asked to rate the changes of 25 different items according to their experience on a 5-point Likert scale where 1= greatly decreased, 3= stayed at the same, and 5 = greatly increased.

##### **4.7.1 Changes in food quality and safety management**

As illustrated in Table 4.5, the improvement of the product traceability, quality of internal procedures and the food safety awareness of employees were among the most statistically significant desirable changes. The level of product quality and safety was also rated by respondents as an item which has increased. The product failure rate and number of product recalls were rated by respondents as items which decreased after the implementation of non-regulatory FSMSs. The desirable increasing changes were in agreement with the findings in the British food manufacturing industry (Mensah & Julien, 2011) and the Serbian meat industry (Tomašević et al., 2013). The improvement of internal procedures was claimed by 83% of respondents as a benefit of the implementation of FSMS in the UK. Fresh-cut produce firms in USA have also experienced these desirable increasing and decreasing changes after implementing quality management systems (Fouayzi et al., 2006).

**Table 4.5: Changes in food quality and safety management**

<b>Items</b>	<b>% rate 1</b>	<b>% rate 2</b>	<b>% rate 3</b>	<b>% rate 4</b>	<b>% rate 5</b>	<b>Mean</b>
<b>Level of product quality and safety</b>	0	2.2	26.1	50.0	21.7	3.91
<b>Product traceability</b>	0	0	19.6	43.5	37.0	4.17
<b>Quality of data for decision making</b>	0	0	45.7	45.7	8.7	3.63
<b>Quality of internal procedures</b>	0	0	19.6	50.0	30.4	4.11
<b>The awareness of employees of food hygiene and safety</b>	0	0	28.3	43.5	28.3	4.00
<b>Product failure rate</b>	4.3	39.1	52.2	4.3	0	2.57
<b>Number of product recalls</b>	10.9	17.4	69.6	2.2	0	2.63

Note: 1 – greatly decreased, 2- slightly decreased, 3 – stayed at the same, 4 – slightly increased, 5 – greatly increased

#### **4.7.2 Changes in market performance**

The ability to maintain current customers and to attract new customers has increased (Table 4.6). The same was found in the fresh-cut produce sector in USA (Fouayzi et al., 2006). The respondents were also increasingly satisfied with access to the domestic market after implementation. If they supplied an overseas market, their satisfaction with access to the overseas market increased as well.

#### **4.7.3 Changes in production cost**

Following the implementation of non-regulatory FSMS, respondents experienced increases in the costs of laboratory tests, record keeping and training (Table 4.7). Other cost increases were in relation to monitoring the production process and internal audits. According to the enterprises, most non-regulatory FSMS require more laboratory tests than government regulations. The audit frequencies of non-regulatory FSMS are also higher. The cost of a product recall was indicated by respondents as remaining the same, which is different from the finding in the fresh-cut produce sector in the USA (Fouayzi et al., 2006) where it decreased. The cost of wastage decreased. After the implementation of non-regulatory FSMS, the personnel have been trained and business operations become standardised, which results in decreased wastage.

**Table 4.6: Changes in market performance**

Items	% rate 3	% rate 4	% rate 5	% rate 0	Mean
Satisfaction with the ability to maintain customers	26.1	47.8	23.9	2.2	3.98
Ability to attract new customers	37.0	34.8	28.3	0	3.91
Satisfaction with access to the domestic market	47.8	28.3	17.4	6.5	3.67
Satisfaction with access to the overseas market	21.7	34.8	26.1	17.4	4.05

Note: 3 – stayed at the same, 4 – slightly increased, 5 – greatly increased, 0 – not applicable

**Table 4.7: Changes in production cost**

Items	% rate 1	% rate 2	% rate 3	% rate 4	% rate 5	Mean
Cost of wastage	6.5	39.1	41.3	13.0	0	2.61
Cost of record keeping	0	2.2	15.2	50.0	32.6	4.13
Cost of monitoring production process	0	2.2	17.4	63.0	17.4	3.96
Cost of laboratory analysis	0	2.2	4.3	30.4	63.0	4.54
Cost of training	0	2.2	13.0	63.0	21.7	4.04
Cost of an internal audit	2.2	0	21.7	47.8	28.3	4.00
Cost of a product recall	2.2	15.2	69.6	6.5	6.5	3.00

Note: 1 – greatly decreased, 2- slightly decreased, 3 – stayed at the same, 4 – slightly increased, 5 – greatly increased



#### **4.7.4 Changes in the relationship with customers**

This study also found that the respondents' relationship with customers changed after implementing non-regulatory FSMS (Table 4.8). Respondents indicated that the number of customers increased, and that they worked more with customers on food safety assurance. The frequency of customer complaints decreased. The same changes were found in the fresh-cut produce sector of the USA (Fouayzi et al., 2006). Respondents reported that customers were less likely to audit/inspect their firms before signing contracts. However, statistically, the average number of audits per customer per year stayed the same although some respondents reported increases. This is different from the finding in the fresh-cut produce sector of the USA where the annual average number of audits per customer increased after implementing quality management systems. The time spent with customers negotiating contracts did not change either.

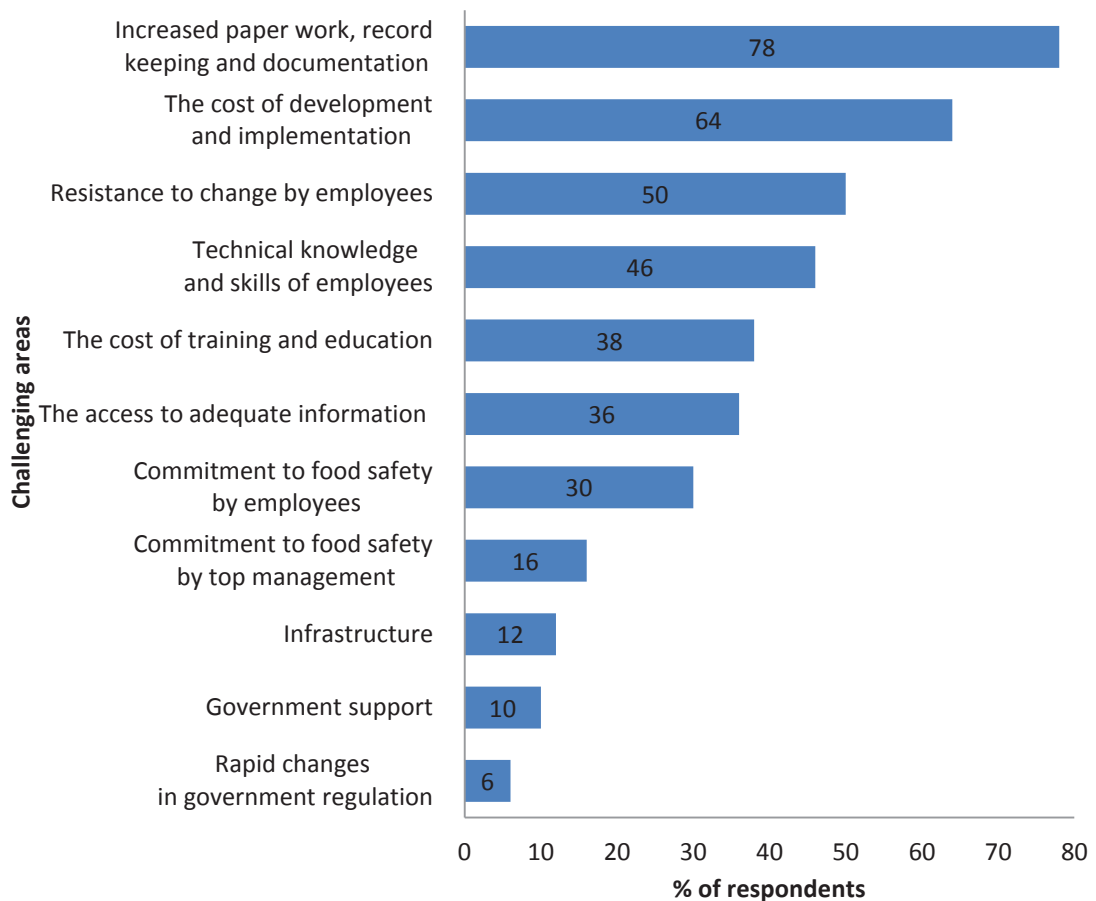
**Table 4.8: Changes in the relationship with customers**

<b>Items</b>	<b>% rate 1</b>	<b>% rate 2</b>	<b>% rate 3</b>	<b>% rate 4</b>	<b>% rate 5</b>	<b>Mean</b>
<b>Number of customers</b>	2.3	4.5	23.1	54.5	4.5	3.55
<b>Average number of audits per customer per year</b>	2.3	22.7	43.2	13.6	18.2	3.23
<b>Frequency of working with customers on food safety assurance</b>	0	11.4	43.2	29.5	15.9	3.50
<b>Likelihood that customers audit/inspect your firm before signing contracts</b>	4.5	34.1	40.9	15.9	4.5	2.82
<b>Time spent with customers to negotiate contracts</b>	2.3	15.9	65.9	13.6	2.3	2.98
<b>Tendency to sign long-term contracts with customers</b>	2.3	2.3	61.4	31.8	2.3	3.30
<b>Frequency of customer complaints</b>	9.1	36.4	45.5	6.8	2.3	2.57

Note: 1 – greatly decreased, 2- slightly decreased, 3 – stayed at the same, 4 – slightly increased, 5 – greatly increased

#### **4.8 Challenges during the implementation of non-regulatory FSMS**

Food and beverage processing enterprises may encounter challenges, such as infrastructure and resistance to change by employees, during the implementation of non-regulatory FSMS. Eleven areas were listed in the questionnaire, and the respondent could select up to five important areas in which their firms have encountered challenges. These challenging areas are related to finance, infrastructure or people. Figure 4.5 lists the six most challenging areas: increased paper work, record keeping and documentation, cost of development and implementation, technical knowledge and skills of employees, resistance to change by employees, cost of training and education and access to adequate information. The first two and the fifth areas were finance related challenges. Technical knowledge, skills of employees and resistance to change by employees were people related areas. The last significant challenging area is infrastructure related. These findings differ from the situation in the UK where four of the top five challenges were all people related (Mensah & Julien, 2011).



**Figure 4.5: Challenging areas during the implementation**

#### **4.9 Ways to overcome challenges**

In response to how enterprises deal with the challenges in those areas mentioned in 4.8, 76% of enterprises that responded reported that they invested in education and training (Figure 4.6) to overcome challenges in the areas of technical knowledge and skills of employees, and with resistance to change by employees. Improvement in internal communication was noted by 60% of respondents, and interventions altering the organisational culture were adopted by 44% of them. These three strategies have also been adopted by the food manufacturing enterprises in the UK (Mensah & Julien, 2011). Other strategies include purchasing new infrastructure, investing in software for food safety and quality management, and hiring a quality assurance manager or

technicians. One respondent also mentioned that they developed contacts in food safety who can give sound advice.



**Figure 4.6: Strategies to overcome challenges**

#### **4.10 Factors influencing the effectiveness of non-regulatory FSMS**

In order to examine the successful implementation factors of non-regulatory FSMS, respondents were asked to rate 6 items on the 4-point Likert scale where 1 = very important and 4 = unimportant. As shown in Table 4.9, the most important factor overall was top management commitment to food safety. This is in agreement with the finding of Mensah and Julien (2011) which showed top management commitment was the most highly ranked successful implementation factor of the food safety management system. Top management commitment can ensure the acceptance of employees and enough support such as financial investment to implement food safety management schemes. Employee's attitude and commitment to food safety and food safety knowledge are the second most important factors. In the study of Fotopoulos, Kafetzopoulos and Psomas (2009), these two were also highly ranked as critical factors

of effective implementation of HACCP by the survey respondents. In the present survey, human resource management, infrastructure and the quality of third-party audits were rated by respondents as somewhat important factors. Other important factors mentioned by respondents were knowledge of external auditors and system design which should be clear, concise and effective.

Most of these factors are related to the food safety culture in food and beverage manufacturing enterprises. A food safety culture can fundamentally impact day-to-day decisions, behaviours and practices that help to effectively implement a food safety management system (Seward et al., 2012). It is a component of the organisational culture in a food business, and is the way in which a food business and its employees deal with and value food safety, including the basic assumption and belief in food safety. Powell, Jacob and Chapman (2011) found the link between failures in food safety culture and foodborne illness outbreaks. Food safety culture should be taken into consideration as a risk factor when a foodborne outbreak takes place (Griffith et al., 2010b).

**Table 4.9: Factors influencing the effectiveness of non-regulatory FSMS**

<b>Factors</b>	<b>% rate 1</b>	<b>% rate 2</b>	<b>% rate 3</b>	<b>% rate 4</b>	<b>Mean</b>
<b>Top management commitment to food safety</b>	80.9	14.9	4.3	0	1.23
<b>Employee's attitude and commitment to food safety</b>	74.5	21.3	4.3	0	1.30
<b>The knowledge of the employee about food safety</b>	51.1	36.2	12.8	0	1.62
<b>Human resource management including training, supervision and communication</b>	40.4	46.8	12.8	0	1.72
<b>Suitability of infrastructure and facilities</b>	38.3	44.7	14.9	2.1	1.81
<b>The quality of the third-party audit</b>	40.4	38.3	14.9	6.4	1.87

Note: 1 – very important, 2 – somewhat important, 3- slightly important, 4- unimportant

#### **4.11 Cost of non-regulatory FSMS**

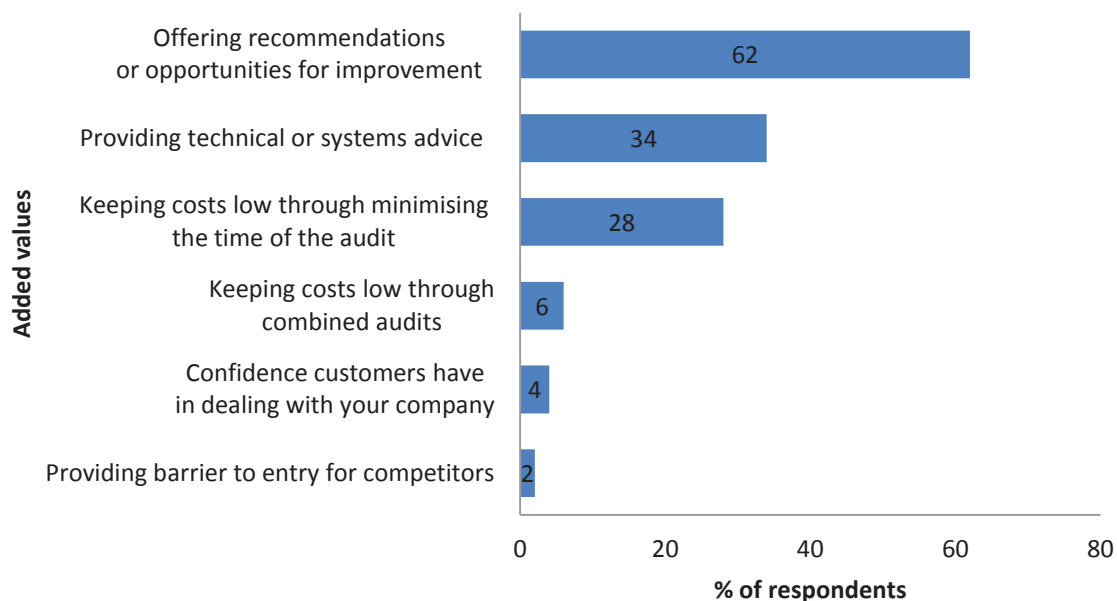
The costs of non-regulatory FSMS include the initial set-up costs and the operating cost. The initial set-up costs are one-time, while the operating costs recur so as to pass the regular audits. Respondents were asked to rank a list of items according to their proportion in the overall cost of implementation or operation. For example, respondents should rank “1” for the largest cost item, rank “2” for the second largest cost item, and rank “3” for the third largest cost item and rank “0” if a cost item has not incurred.

The ranking of implementation costs indicates that system design and development, and external audit fees were two important implementation costs. This verifies the finding in 4.8 which indicates that the cost of development and implementation is among the six most challenging areas. According to enterprises, the external audit fees laid a heavy financial burden on the food businesses especially the small and medium sized ones. Half of the respondents did not purchase new facilities during the implementation; however, new investment in facilities was regarded by most respondents, who had to buy these facilities, as the largest proportion of implementation cost. The cost of the internal audit is not significant. Other implementation costs indicated by respondents were investing in human resources such as training, hiring food safety experts and consulting external food safety experts. The ranking of operating costs indicates that external audit fees, and sampling and testing are the two significant operating costs. Record keeping was not ranked by respondents as a high proportion of overall operating costs. Recurring training was not a major operating cost either.



#### **4.12 Respondents' attitudes toward certification bodies**

As third-party certification bodies have played an important role in the verification of the non-regulatory FSMS through their business of certification and supply chain audits (Hatanaka et al., 2005), this study explored the respondents' attitude to certification bodies, including perceived values added by chosen third-party certification bodies and the importance of the CBs' service for them to continuously improve the food safety management system. CBs provided recommendations or opportunities for improvement for 62% of responding enterprises, while providing technical or systems advice was indicated as the second added value (Figure 4.7). Other added value included lowering cost via minimising audit time or combined audits, the increasing confidence customers have in dealing with enterprises, and providing a barrier to the entry of competitors. External audits helped the quality assurance manager to gain further support from senior management for one respondent. In response to the question about the importance of the certification bodies' service for them to continuously improve the food safety management system, 66% of respondents rated 1 or 2 on the 5-point Likert scale where 1 = extremely important and 5 = not at all important. The mean of responses was 2.26.



**Figure 4.7: Values added by chosen third-party CBs**

#### **4.13 Discussion and conclusions**

Food safety is a concern for government agencies, NGOs, the public, the food industry and other stakeholders. In New Zealand, food and beverage manufacturing enterprises have to comply with both regulatory and non-regulatory requirements. This chapter examined the implementation of non-regulatory FSMS in the food and beverage industry in New Zealand, investigated the motivation for and the impact of these schemes. In New Zealand, food and beverage manufacturers have had some different experience from other countries during the implementation of non-regulatory FSMS. Seventeen different non-regulatory schemes have been implemented, which were grouped into three broad categories: public international standard schemes, public industry sector schemes and private individual firm schemes. The implementation of these schemes was mainly driven by major customers' requirements, a desire to improve product quality and safety and the desire to be recognized by the industry and the public. After the implementation of these schemes, enterprises experienced many

desirable changes such as the improvement of product traceability, increasing food safety awareness of employees, satisfaction with the ability to maintain customers, decreasing cost of wastage and reduced customer complaints. In order to overcome the challenges of the increased paper work, technical knowledge and skills of employees, and resistance to change by employees, enterprises have invested in education and training, improved internal communications, and altered their organisational culture. Food safety culture is vital to ensure non-regulatory FSMSs are effectively implemented. The costs of system design and development and external audit fees are the major implementation costs of non-regulatory FSMS, while external surveillance audit fees and product testing are the major operating costs. Third-party CBs have played an important role in the implementation of these schemes. They can provide added value with their audit and inspection services, and are important for enterprises to continuously improve their own food safety management system.

Food and beverage exports have been vital to the economy of New Zealand for over 100 years, and are among the core competencies of the country. Given the paramount importance of this industry, a stringent food safety regulatory system has been introduced by the government to regulate the food and beverage production for both domestic and overseas markets. However, overseas customers in the USA, EU, Australia and even Asia have extra requirements for food safety. Due to the small population of the country, the domestic market for food and beverages is relatively small, and it is highly concentrated, being dominated by two main players Progressive Enterprises and Foodstuffs. In the present survey, 78% of respondents were SMEs. Food and beverage enterprises have to target overseas markets when they are much smaller and at an earlier stage of their business development than other countries.

These unique characteristics of the New Zealand food and beverage industry perhaps determined the different experiences of food and beverage enterprises during the implementation of non-regulatory FSMS. To maintain current customers or gain the access to new overseas markets, the enterprises have to meet the requirements of major customers in food safety management. For the domestic market, they have to implement WQA and other approved supplier programmes in order to supply Progressive Enterprises and food service businesses such as the franchises of McDonald and KFC. For overseas markets, they have to implement HACCP, BRC, SQF, ISO 22000 etc. Many financial challenges have been encountered during the implementation of non-regulatory FSMS. Different desirable changes were experienced as a consequence of the implementation of non-regulatory FSMS.

This study provides baseline information on the implementation of non-regulatory food safety management schemes in New Zealand, and adds substantially to the understanding of non-regulatory food safety management. To my knowledge, this is the first time that non-regulatory FSMS has been investigated in the context of the New Zealand food and beverage manufacturing industry. Due to the unique characteristics of the New Zealand food and beverage industry, the level of importance of certain motivations differ from the previous studies. Different challenges and changes had been encountered by respondents as well.

The findings of this study could help the owners of these schemes or the drafters of standards to improve these schemes. More attention should be paid to the challenges encountered by food businesses and the critical factors influencing their effectiveness. With a better understanding of the drivers for food businesses to implement non-regulatory FSMS, the scheme owner should design an institution which could maximize

the implementation. Another implication of this study is the possibility that government agencies should consider the current status of non-regulatory food safety management when they formulate food safety regulating policies. One feasible option is to accept and recognize the results of non-regulatory food safety audits and to build a new public-private food safety regulatory paradigm. In this way, the compliance cost of the food industry could decrease, and the government agencies also could utilize their limited budgets more effectively.

## **CHAPTER 5 THE INFLUENCE OF ENTERPRISE ATTRIBUTES ON THE DECISIONS OF FOOD MANUFACTURING ENTERPRISES TO IMPLEMENT NON-REGULATORY FOOD SAFETY MANAGEMENT SCHEMES**

### **5.1 Introduction**

In the survey of non-regulatory food safety management among the food manufacturing enterprises in New Zealand, the respondents indicated that they experienced changes in the food quality and safety management, market performance, production costs and relationships with customers after the implementation of non-regulatory food safety management schemes (FSMS). However, each enterprise has specific characteristics (e.g. sub-sector and size). The changes in those aspects differed from one enterprise to another. The costs and benefits to implement non-regulatory FSMS differ as well. Therefore, during the decision making of an individual enterprise, regarding the implementation of non-regulatory FSMS, the incentives investigated in the survey among the food manufacturing enterprises may have different degrees of relative importance. Given that respondents are associated with enterprises that vary in many aspects (such as regulatory environment, size, and target markets), this chapter focuses attention on how enterprise attributes affect the propensity to implement non-regulatory FSMS in the context of the food manufacturing industry in New Zealand.

Exploring the relationship between enterprise characteristics and the propensity to implement non-regulatory FSMS could provide information for the design of non-regulatory FSMS and related public policy. Few non-regulatory schemes have taken full account of the differing incentives for the food manufacturing companies to

implement them during their design (Green & Kane, 2014). This limited the implementation of these schemes and even influenced the effectiveness of these schemes in terms of ensuring food safety.

The association between enterprise characteristics and the propensity to implement certain food safety and quality standards has been examined in previous studies (Herath et al., 2007; Holt & Henson, 2000; Jin & Zhou, 2011; Masakure et al., 2009; Scott et al., 2009; Zhou et al., 2011). The characteristics included sub-sector, size, ownership, destination market, and the regulating environment. In the survey of non-regulatory food safety management among the food manufacturing enterprises in New Zealand, respondents indicated their sub-sectors, size, business type, regulating environment, and destination markets. In New Zealand, the regulating environment of food manufacturing enterprises is related to the type of products they produce. Some regulation is specific to the food type. More than 82% of the respondents of this survey were registered limited liability companies. Therefore, the enterprise demographics included in the analysis are only the industry sub-sector, size based on employee numbers and exporting status. Based on the type of product manufactured by the respondents of the survey among the food manufacturing enterprises in New Zealand, they were grouped into three sub-sectors of the food manufacturing industry: animal products, vegetal products, and products with long shelf life at ambient temperature (ISO, 2007). The size of different respondents included micro, small, medium, and large sized. The exporting status was domestic market only or exporting. This chapter firstly examines the association between the propensity of respondents to implement non-regulatory FSMS and the enterprise demographics via Cross-Tabulation

analysis and Binary Logistic Regression. Then the associations between enterprise characteristics and the relative importance of different incentives are investigated through the Cross-Tabulation analysis and a comparison of means.

## **5.2 Association between the propensity of respondents to implement non-regulatory FSMS and the enterprise demographics**

### **5.2.1 Results of the Cross-Tabulation analysis**

#### **5.2.1.1 The influence of sub-sector**

The percentage of respondents in different sub-sectors who had non-regulatory FSMS in place is shown in Table 5.1, as well as the values of phi, Chi-square and p for the Cross-Tabulation analysis of all pairs of variables between sub-sectors and the decision of food manufacturing enterprises to implement non-regulatory FSMS. Respondents who produced vegetal products or products with long shelf life at ambient temperature were the most likely to implement these schemes, while respondents who manufactured animal products were less likely to have these schemes in place. The relationship between the animal products sub-sector and the decisions of respondents to implement these schemes was significant ( $p < 0.05$ ), the strength of this association is moderate as the phi value was -0.233 (Healey, 2012). The associations between the sub-sectors of vegetal products and products with long shelf life at ambient temperature and the decisions of respondents to implement these schemes were significant ( $p < 0.10$ ), and the strength of both associations was moderate.



**Table 5.1: Association between decision to implement non-regulatory FSMS and sub-sectors**

<b>Sub-sectors</b>	<b>% of total respondents (n)</b>	<b>% of respondents non-regulatory FSMS in place (n)</b>	<b>Chi-Square</b>	<b>p</b>	<b>Phi</b>
<b>Animal products</b>	65.8% (75)	34.7% (26)	6.186	0.013	-0.233
<b>Vegetal products</b>	17.5% (20)	60.0% (12)	2.866	0.090	0.159
<b>Products with long shelf life at ambient temperature</b>	33.3% (38)	55.3% (21)	3.508	0.061	0.175

Note: One respondent may cover more than one sub-sector. This is a summary of three sets of Cross-Tabulations

This finding is consistent with previous research showing that the industry type influences the decision to implement food safety and quality management practices (Hassan et al., 2006; Henson & Holt, 2000; Herath et al., 2007; Masakure et al., 2009). However, the specific influences of different sub-sectors differ from the research results of Herath, Hassan and Henson (2007). They suggested that the fish, dairy, and fruit and vegetable processing sub-sectors were more likely to implement food safety and quality management schemes than the cereal, meat and other sub-sectors in the Canadian food industry. In their research, they did not differentiate non-regulatory schemes from government laws and regulations, and investigated all of them as food safety and quality management schemes. The products of different sub-sectors have different food safety risk profiles and are regulated under different laws and regulations in some countries. In New Zealand, the animal products manufacturing sub-sector is regulated under the Animal Product Act 1999, while the sub-sector of vegetal products is regulated under the Food Act 1981. The different regulatory

environment could be one of the reasons why the propensity of the respondents in different sub-sectors to implement non-regulatory schemes varied.

#### 5.2.1.2 The influence of size

Table 5.2 presents results from the Cross-Tabulation analysis between enterprise size and the decision of respondents to implement non-regulatory FSMS. The enterprise size correlated significantly ( $p < 0.01$ ) with the food manufacturing enterprises' likelihood to implement non-regulatory FSMS. The larger the enterprise, the more likely it will implement these schemes. The strength of the association between enterprises' decision to implement these schemes and their size was moderate ( $G = 0.531$ , Table 2) (Healey, 2012).

**Table 5.2: Association between decision to implement non-regulatory FSMS and size**

Size	% of total respondents (n)	% of respondents Non-regulatory FSMS in place	Chi-Square	p	Gamma G
Micro	11.4% (13)	15.38% (2)	13.423	0.004	0.531
Small	56.1% (64)	37.5% (24)			
Medium	10.5% (12)	41.7% (5)			
Large	21.9% (25)	72% (18)			

This finding agrees with earlier research that the firm size has an impact on the propensity to implement food safety and quality management schemes (Chen, Flint, Perry, Perry, & Lau, 2015; Hassan et al., 2006; Herath et al., 2007; Jin & Zhou, 2011; Masakure et al., 2009; Zhou et al., 2011). As identified in Chapter 4, many respondents of the survey among food manufacturing enterprises have experienced challenges with

respect to the costs of development and implementation when they put in place non-regulatory schemes. There are cost disadvantages for smaller food enterprises to implement food safety and quality practices (Herath et al., 2007). Without external pressure, these smaller firms may decide not to implement non-regulatory schemes.

### 5.2.1.3 The influence of exporting status

Table 5.3 looks at the relationship between exporting status and having non-regulatory FSMS in place, with values of Phi, Chi-square and p from the Cross-Tabulation analysis. The exporting status of a food manufacturing enterprise had a significant ( $p < 0.05$ ) association with its propensity to implement non-regulatory FSMS. As the value for phi was only 0.22, the strength of this relationship is moderate (Healey, 2012). The respondents who supplied overseas markets were more likely to implement non-regulatory schemes.

**Table 5.3: Association between decision to implement non-regulatory FSMS and export status**

Exporting Status	% of total respondents (n)	% of respondents Non-regulatory FSMS in place	Chi-Square	p	Phi
Exporting	62.3% (71)	50.7% (36)	4.58	0.032	0.22
Domestic market only	37.7% (43)	30.2% (13)			

There are several possible explanations for this relationship. To gain or maintain the access to overseas markets, exporting enterprises have to meet requirements of their major customers in food safety management. Most of those requirements are embedded into non-regulatory schemes, and then exporting enterprises must have certain non-regulatory FSMS in place. The proportion of the respondents who

exported increased along with an increase of the enterprise size (Table 5.4). Larger enterprises could have cost advantages in regard to the implementation of non-regulatory schemes. This finding corroborated the findings of the previous studies in this field. The same association between the enterprise's targeted market and the propensity to implement food safety schemes was found in China (Jin & Zhou, 2011). In Canada, it was found that to maintain access to overseas markets was extremely important for Canadian firms to implement food safety practices (Hobbs et al., 2002).

**Table 5.4: Association between the exporting status and enterprise size**

	<b>% of micro sized respondents (n)</b>	<b>% of small sized respondents (n)</b>	<b>% of medium sized respondents (n)</b>	<b>% of large sized respondents (n)</b>
<b>Exporting</b>	15.4% (2)	64.1% (41)	58.3% (7)	84.0% (21)
<b>Domestic market only</b>	84.6% (11)	35.9% (23)	41.7% (5)	16.0% (4)

### 5.2.2 Results of the Binary Logistic Regression

Binary Logistic Regression was applied to examine the quantitative impacts of the enterprise characteristics on the decision of food manufacturing enterprises to implement non-regulatory FSMS. A dichotomous dependent variable takes a value of 0 when there was no non-regulatory FSMS in place and a value of 1 when there was at least one non-regulatory FSMS in place. The enterprise demographics included in the regression are the sub-sector of the food manufacturing industry, the size based on employee numbers and the exporting status (Table 5.5).

**Table 5.5: Variables for the Binary Logistic Regression**

Variable	Description
<b>Dependent variable</b>	
- <b>Non-regulatory FSMS in Place</b>	Y=1, the respondent implemented at least one non-regulatory FSMS Y=0, the respondent did not implement any non-regulatory FSMS
<b>Independent variables</b>	
- <b>Sub-sector</b>	Animal products=1, otherwise=0  Vegetal products=1, otherwise=0  Products with long shelf life at ambient temperature=1, otherwise=0
- <b>Size</b>	Micro= Reference category  Small= 1, otherwise=0  Medium=1, otherwise=0  Large=1, otherwise=0
- <b>Exporting status</b>	Exporting=1  Domestic market only=0

The result of the Omnibus Test of Model Coefficients suggests that the full model has significantly increased the ability to predict the decisions of respondents, compared to a model with intercept only,  $\chi^2(7, N=114)=23.14$ ,  $p<0.05$ . The model is capable of correctly classifying 57.1% of those who implemented at least one non-regulatory FSMS and 78.5% of those who did not implement any non-regulatory FSMS, for an overall correct rate of 69.3%.

Table 5.6 illustrates the Binary Logistic Regression coefficient, Wald test, p-value, and odds ratio for each of the independent variables. The p-value of the Hosmers and Lemeshow Test was 0.985 and indicated that it was non-significant. Hence, the model fits the data well. Only “vegetal products” and “large sized” had significant partial effects ( $p < 0.10$ ). The odds ratio for “vegetal products” indicated that when keeping all other independent variables constant a respondent which produced vegetal products was 2.85 times more likely to implement non-regulatory FSMS than the respondents which manufactured products with a long shelf life at ambient temperature or animal products. The enterprise size was dummy coded using the micro sized group as the reference group. Only the large sized group was more likely to have a non-regulatory FSMS in place than the micro sized group. The odds ratio for “large sized” suggested that the odds of implementing non-regulatory FSMS for large sized respondents was 9.74 times higher than for the micro sized respondents.

The B value for “animal products” was negative. Inverting the odds ratio for “animal products” suggested that the odds of having non-regulatory FSMS in place for a respondent which produced animal products was 1.47 times lower than for the respondents which manufactured other products. The odds ratio for “products with long shelf life at ambient temperature” revealed that the odds of implementing non-regulatory FSMS for a respondent in this sub-sector was 1.89 times higher than for the other respondents. The odds of having non-regulatory FSMS in place for small sized respondents was 2.26 higher than for the micro sized respondent, and the odds for medium sized respondents was 2.80 higher. The odds of implementing non-regulatory FSMS for an exporting respondent was 1.18 higher than that for respondents who only supplied the domestic market.

**Table 5.6: Results of the Binary Logistic Regression**

Independent variable	B	Wald $\chi^2$	P	Odds ratio
<b>Sub-sector</b>				
- Animal products	-0.387	0.39	0.535	0.679
- Vegetal products	1.048	2.79	0.095	2.853
- Products with long shelf life at ambient temperature	0.638	1.07	0.301	1.892
<b>Size</b>		8.70	0.034	
-Small	0.815	0.85	0.356	2.258
-Medium	1.301	1.00	0.318	2.804
-Large	2.276	5.42	0.020	9.737
<b>Exporting status</b>	0.595	1.58	0.209	1.183

### **5.3 The association between the incentives for enterprises to implement non-regulatory FSMS and enterprise characteristics**

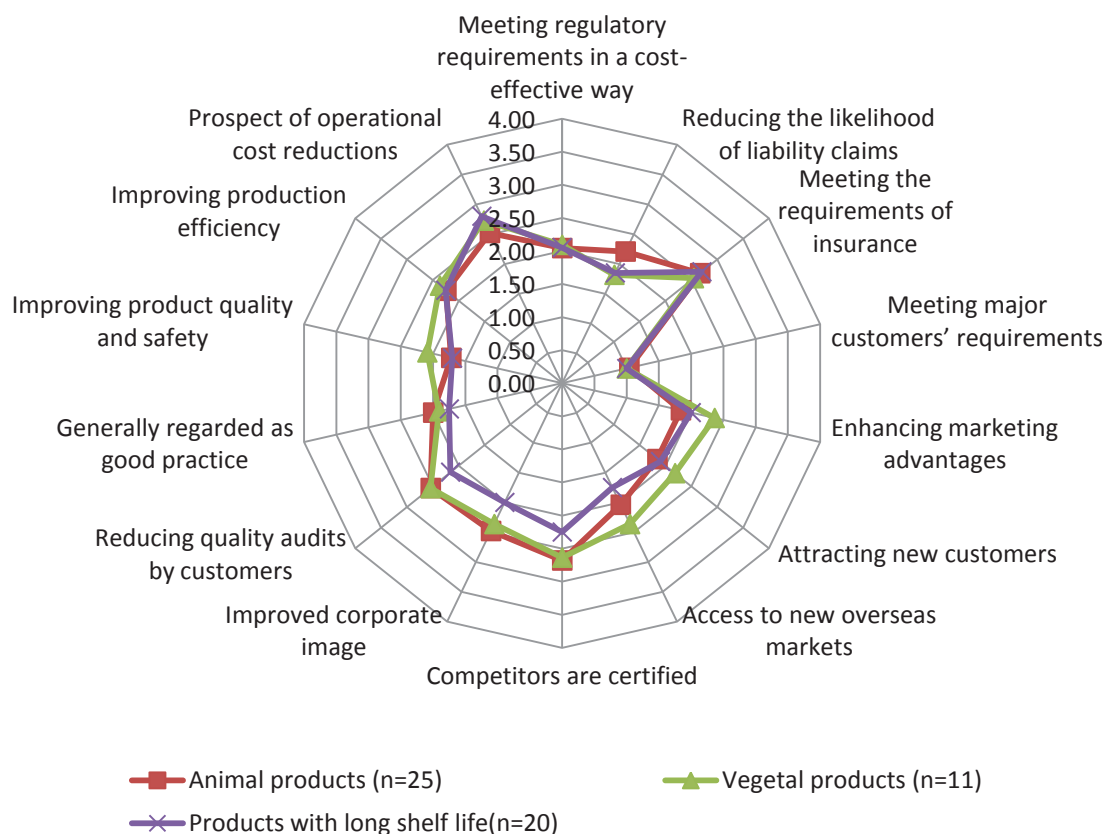
#### **5.3.1 The influence of sub-sectors**

The most important incentive for food manufacturing enterprises to implement non-regulatory schemes is to meet major customer's requirements, whatever sub-sector the enterprise is in. The mean values for the importance of "meeting major customer's requirements" did not vary among different sub-sectors. The sub-sector also had few impacts on the relative importance of incentives like "meeting regulatory requirements in a cost-effective way" and "improving product quality and safety". The other incentives provided in the questionnaire were ranked differently by respondents in different sub-sectors (Figure 5.1).

Respondents who produced vegetal products and products with long shelf life at ambient temperature were more likely to be motivated by reducing the likelihood of liability claims than those who produced animal products. Compared to the overall responses, respondents in the sub-sector of vegetal products ranked “meeting the requirement of insurance” as a more important incentive, while respondents in the sub-sector of products with long shelf life at ambient temperature ranked it as a less important one. “Enhancing marketing advantages” was ranked as a more important incentive by respondents in the sub-sector of animal products, and was regarded as a less important incentive by respondents in the sub-sector of vegetal products.

Respondents in the sub-sector of vegetal products ranked “attracting new customers” as a less important incentive in contrast to other respondents. “Access to new overseas markets” was of more importance for respondents in the sub-sector of products with long shelf life at ambient temperature, while it was less important for respondents in the sub-sector of vegetal products.





**Figure 5.1: Mean values of incentives for different sub-sectors**

Note: 1 - very important, 2 – somewhat important, 3 – slightly important, 4 – unimportant

“Competitors are certified”, “improved corporate image” and “reducing quality audits by customers” were regarded as important incentives by respondents in the sub-sector of products with long shelf life at ambient temperature, while they were ranked as less important incentives by respondents in the sub-sector of animal products. “Generally regarded as good practice” was ranked as a less important incentive by respondents in the sub-sector of animal products than others. “Improving product quality and safety” was of less importance for respondents in the sub-sector of vegetal products than others. The “prospect of operation cost reductions” was ranked as an important

incentive by respondents in the sub-sector of animal products, while it was regarded as a less important driver by respondents in the sub-sector of vegetal products.

The results from the Cross-Tabulation analysis revealed several statistically significant associations between incentives and sub-sectors. The association between the sub-sector of animal products and “reducing quality audits by customers” was significant ( $p < 0.05$ ), but the strength of this relationship was weak as the value for Gamma was only 0.234 (Healey, 2012). The association between the sub-sector of vegetal products and “enhancing marketing advantages” was significant ( $p < 0.05$ ), and the strength of this association was moderate ( $G = 0.425$ ). The relationships between the sub-sector of products with a long shelf life at ambient temperature and “reducing the likelihood of liability claims”, “attracting new customers” and “reducing quality audits by customers” were significant ( $p < 0.05$ ), however, the strength of these associations were all weak as their absolute values for Gamma were less than 0.30 (Healey, 2012).

For respondents in the sub-sector of animal products, the most important incentive to implement non-regulatory FSMS was “meeting major customers’ requirements”. The second important group of incentives included “improving product quality and safety”, “enhancing marketing advantages”, “attracting new customers” and “generally regarded as good practice”. A third group of relatively important incentives were “access to new overseas markets”, “meeting regulatory requirements in a cost-effective way”, “reducing the likelihood of liability claims” and “improving production efficiency”. The least important drivers were “meeting the requirements of Insurance” and “competitors are certified”.

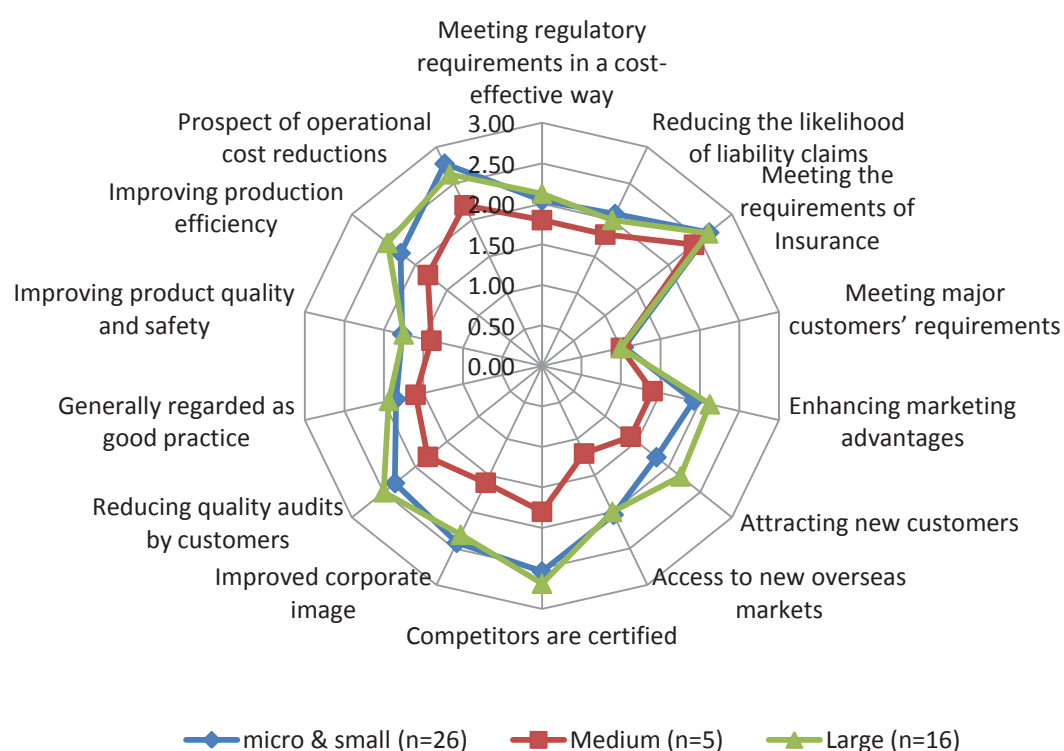
For respondents in the sub-sector of vegetal products, the most important driver to implement non-regulatory FSMS was “meeting major customers’ requirements”. The second most important group of incentives consisted of “reducing the likelihood of liability claims”, “generally regarded as good practice”, “meeting regulatory requirements in a cost-effective way” and “improving product quality and safety”. The third group of relatively important incentives included “attracting new customers”, “enhancing marketing advantages”, “access to new overseas markets”, “improved corporate image” and “improving production efficiency”. The least important motivation was “prospect of operational cost reductions”.

For respondents in the sub-sector of products with long shelf life at ambient temperature, the most important motivation to implement non-regulatory FSMS was “meeting major customers’ requirements”. The second important group of incentives included “improving product quality and safety”, “access to new overseas markets”, “generally regarded as good practice” and “reducing the likelihood of liability claims”. The third group of relatively important drivers consisted of “attracting new customers”, “enhancing marketing advantages”, “improved corporate image” and “meeting regulatory requirements in a cost-effective way”. The least important incentives were “meeting the requirements of insurance” and “prospect of operational cost reductions”.

### **5.3.2 The influence of enterprise size**

“Meet major customers’ requirements” was the most important driver to implement non-regulatory schemes for respondents of all sizes. Micro & small, and large sized enterprises ranked most incentives at a similar level of importance, except for “attracting new customers” which was less important for large sized enterprises

(Figure 5.2). There were more variations between medium and other sized enterprises. The levels of importance of most incentives ranked by medium sized respondents were higher than other sized enterprises. The results from Cross-Tabulation analysis did not reveal any statistically significant associations between incentives and the enterprise size. The absolute values of Gamma were less than 0.30, which meant the strength of the influence of size was relatively weak. This finding is consistent with that of Mensah and Julien (2011) who found that there was no significant impact of enterprise size on the drivers to comply with food safety management practices (both regulatory and non-regulatory).



**Figure 5.2: Mean values of incentives for different sizes**

Note: 1 - very important, 2 – somewhat important, 3 – slightly important, 4 – unimportant

For micro & small sized respondents, the most important incentive to implement non-regulatory FSMS was “meeting major customers’ requirements”. The second important group of incentives included “improving product quality and safety” and “attracting new customers”. The third group of relatively important drivers consisted of “generally regarded as good practice”, “enhancing marketing advantages”, “access to new overseas markets”, and “reducing the likelihood of liability claims”. The least important driver was the “prospect of operational cost reductions”.

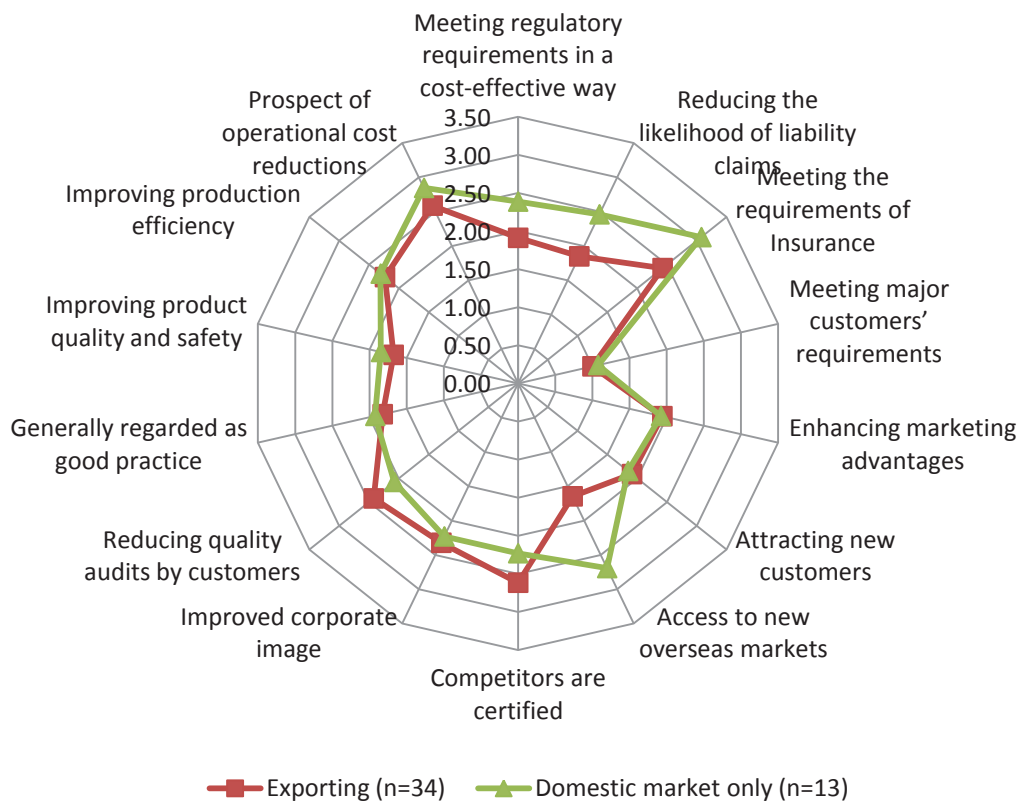
For medium sized enterprises, the most important motivation to implement non-regulatory FSMS was “meeting major customers’ requirements”. The second most important group of incentives consisted of “access to new overseas markets”, “improving product quality and safety”, “attracting new customers”, and “enhancing market advantages”. Most incentives of this group were market-based. The third group of relatively important incentives were “improved corporate image” and “generally regarded as good practice”. The least important incentive was to meet the requirement of insurance.

For large sized enterprises, the most important incentive to implement non-regulatory FSMS was “meeting major customers’ requirements”. The second important group of incentives included “improving product quality and safety” and “generally regarded as good practice”. Both incentives were internal improvement-driven. Large sized respondents were more likely to be driven by improvement-driven incentives. The third group of relatively important drivers consisted of “access to new overseas markets” and “reducing the likelihood of liability claims”. The least important incentive was “attracting new customers”.

### 5.3.3 The influence of enterprise exporting status

Meeting major customers' requirements was the most important incentive of both exporting and domestic market focused food manufacturing enterprises to implement non-regulatory food safety management schemes (Figure 5.3). Regulatory and liability incentives were more important for exporting companies than enterprises who focused on the domestic market only. As expected, "access to new overseas markets" was less important for domestic market focused respondents. Domestic market focused respondents paid more attention to whether competitors were certified or not when they made the decision to implement non-regulatory schemes. For other incentives provided in the questionnaire, there were few variations between exporting and domestic market focused respondents.

The results from the Cross-Tabulation analysis revealed several statistically significant associations between incentives and the exporting status. The relationships between the exporting status and "meeting regulatory requirements in a cost-effective way", "reducing the likelihood of liability claims", "meeting requirements of insurance" and "access to new overseas markets" were significant ( $p < 0.05$ ). The value for Gamma of the associations between the exporting status and "reducing the likelihood of liability claims", "meeting requirements of insurance" was -0.564 and -0.448 respectively, so the strength of these relationships was fairly substantial. The strength of the relationship between the exporting status and "access to new overseas markets" was strong ( $G = -0.624$ ), while the strength of the association between the exporting status and "meeting regulatory requirements in a cost-effective way" was weak as the Gamma value was -0.261.



**Figure 5.3: Mean values of incentives for different exporting status**

Note: 1 - very important, 2 – somewhat important, 3 – slightly important, 4 – unimportant

For exporting enterprises, the most important motivation to implement non-regulatory FSMS was “meeting major customers’ requirements”. The second most important group of incentives included “access to new overseas markets” and “improving product quality and safety”. The third group of relatively important incentives consisted of “reducing the likelihood of liability claims” and “generally regarded as good practice”. The least important incentive was “competitors are certified”.

For domestic market focused respondents, the most important incentive to implement non-regulatory FSMS was also “meeting major customers’ requirements”. The second

important group of incentives included “improving product quality and safety” and “attracting new customers”. The third group of relatively important drivers consisted of “enhancing marketing advantages” and “generally regarded as good practice”. “Meet the requirements of insurance” was the least important one.

#### **5.4 Discussion and conclusions**

This chapter examined the impacts of enterprise demographics on the food manufacturing enterprise’s decision to implement non-regulatory FSMS in New Zealand. Enterprise attributes included in the analysis were the sub-sector of the food manufacturing industry, size and exporting status. Respondents who produced animal products were less likely to have non-regulatory FSMS in place than those who produced vegetal products and products with long shelf life at ambient temperature. In New Zealand, the regulatory environments are different for different sub-sectors of the food manufacturing industry. The sub-sector of “animal products” is regulated under the Animal Product Act 1999, which requires animal products manufacturing to implement a Risk Management programme. The sub-sectors of “vegetal products” and “products with long shelf life at ambient temperature” are regulated under the Food Act 1981. The requirements of the Animal Product Act 1999 are more stringent than those of the Food Act 1981. This supports one of the research hypotheses that the more mandatory regulations are involved in food safety management, the fewer food businesses implement voluntary food safety management schemes. This finding is consistent with previous research into the associations between the industry type and the decision to implement food safety and quality management practices. The enterprise size and exporting status had substantial impacts on the decision of respondents to implement those schemes. Larger sized respondents and exporting



respondents were more likely to implement those schemes. This could be explained by the fact that a larger food enterprise has a lot more to lose from a food safety incident, and will have more resources than a smaller enterprise. Larger enterprises could have cost advantages in regard to the implementation of non-regulatory schemes. Thus, large sized enterprises are likely to invest in food safety and quality management and implement non-regulatory FSMS. Most of those requirements are embedded into non-regulatory schemes. Hence, exporting enterprises must have certain non-regulatory FSMS in place in order to gain or maintain the access to overseas markets. The results from the Binary Logistic Regression revealed that only “vegetal products” and “large sized” had significant ( $p < 0.10$ ) partial effects. However, the model was capable of correctly classifying the propensity of 69.3% of respondents to implement non-regulatory FSMS.

When examining the influences of these three characteristics of enterprise (sub-sector, size and exporting status) on the relative importance of different incentives to implement non-regulatory FSMS, it was found that they could influence the importance of most incentives as ranked by the respondents for certain characteristics. The relative order of importance for incentives differed for the respondents in different groups although the most important driver for all respondents was “meeting major customers’ requirements”. This finding validated that enterprise characteristics made substantial difference on the food manufacturing enterprise’s decision to implement non-regulatory FSMS.

Taken together, these empirical research results suggest that enterprise characteristics have notable impacts on the propensity of food manufacturing enterprises to

implement non-regulatory FSMS in New Zealand. This verified the finding of previous studies which examined the association between enterprise characteristics and the propensity to implement certain food safety and quality standards. This finding is consistent with previous research showing that the industry type influences the decision to implement food safety and quality management practices (Hassan et al., 2006; Henson & Holt, 2000; Herath et al., 2007; Masakure et al., 2009). However, the specific influences of different sub-sectors differ from the research results of Herath, Hassan and Henson (2007). In order to validate this kind of association, this study examined the association between enterprise characteristics and the relative importance of different drivers.

In order to maximize the application of non-regulatory FSMS, the scheme owners should take these impacts into consideration when they design a scheme. Specific environments and the food safety risk profile of different sub-sectors of the food industry should be reflected in the standards or specifications of these schemes. The implementation costs of these schemes can be reduced by optimising the implementation processes. For instance, publically available and detailed guidance for different sized food manufacturing enterprises to implement these schemes could be developed and provided to enterprises. Then the scheme could reach the targeted food manufacturing enterprises. As the relative importance of most incentives differs for the different attributes of food manufacturing enterprises, third-party certification bodies should take different marketing strategies when promoting non-regulatory FSMS to different food enterprises.



## **CHAPTER 6 THE INFLUENCE OF ENTERPRISE ATTRIBUTES ON THE EXPERIENCE OF NON-REGULATORY FOOD SAFETY MANAGEMENT SCHEMES IN THE FOOD MANUFACTURING INDUSTRY**

### **6.1 Introduction**

The analysis in Chapter 5 revealed that enterprise attributes (sub-sectors, size, and exporting status) could influence the decisions of food manufacturing enterprises to implement non-regulatory food safety management schemes (FSMS). The reason behind this kind of impact is that different food manufacturing enterprises perceive non-regulatory FSMS differently. They have different evaluations of the costs and benefits of the implementation of these schemes. Following the implementation of non-regulatory FSMS, enterprises could experience different changes in food safety and quality management, market performance, production costs, and relationships with customers. The impacts of enterprise attributes on the experience of food safety and quality management have been investigated in several studies (Holleran et al., 1999; Mensah & Julien, 2011; Seddon, Davis, Loughran, & Murrell, 1993). Some found that these attributes had significant effects, while others did not identify significant effects. There are few reports on the impact of enterprise attributes on the experiences of non-regulatory food safety management schemes.

Understanding the influence of these enterprise demographics on the experience of non-regulatory FSMS (e.g. challenges, costs, and benefits) can help to more thoroughly understand why enterprise characteristics have notable impacts on the propensity of food manufacturing enterprises to implement non-regulatory FSMS. In addition, they provide clear information on the implementation process of these non-regulatory

schemes, such as what kinds of benefits can be achieved through the implementation and what kinds of difficulties and challenges can be expected for a certain group of enterprises. It can also provide information for certification bodies to facilitate their risk assessment of different types of food manufacturing enterprises to improve their audit quality and to take different market strategies to promote non-regulatory FSMS.

The enterprise demographics included in the analysis of this chapter are the sub-sector of the food manufacturing industry, size (based on employee numbers) and exporting status. As the number of respondents was relatively small, the size included only three groups (micro & small, medium, and large). This chapter first examines the impact on the implementation strategies of non-regulatory FSMS. Then, the association between changes as a consequence of implementing non-regulatory FSMS and enterprise characteristics are investigated in section 6.3. Section 6.4 deals with the impact on the challenges during the implementation of non-regulatory FSMS.

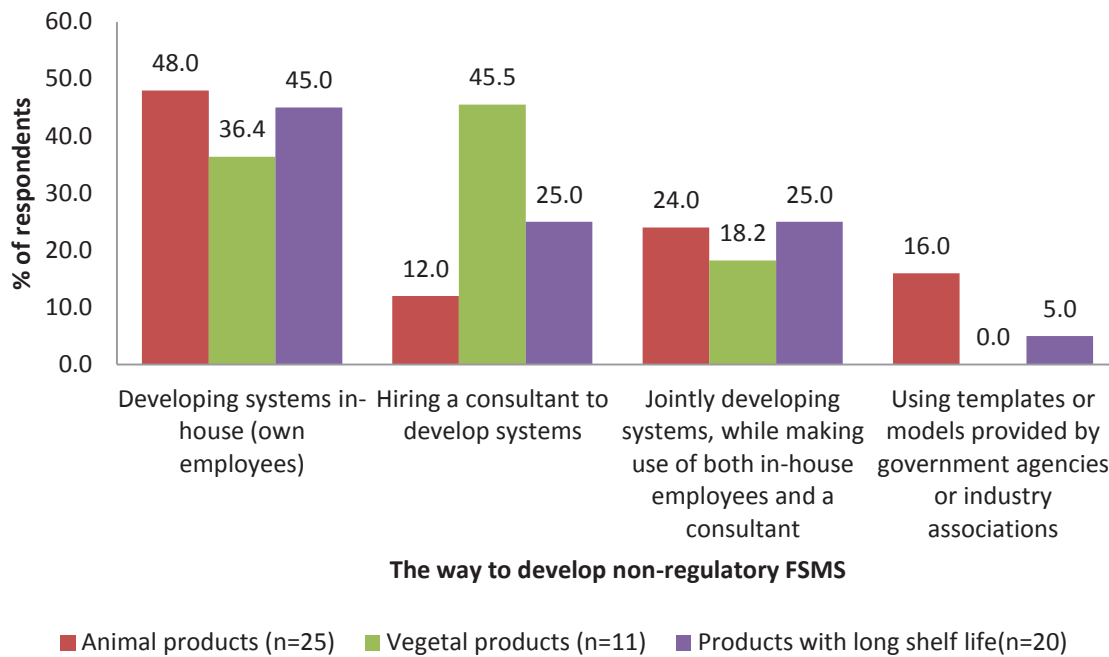
## **6.2 The association between the implementation strategy of non-regulatory FSMS and enterprise characteristics**

The respondents of different sub-sectors chose different strategies to develop non-regulatory FSMS in order to achieve successful audits (Figure 6.1). Respondents in the sub-sector of vegetal products were less likely to develop their systems in house than those of the other two sub-sectors. Developing systems using their own employees was the favoured choice for respondents in the sub-sector of animal products. Compared to the other two sub-sectors, a larger proportion of respondents in the sub-sector of vegetal products outsourced the development to a consultant. Respondents in the sub-sector of animal products were the least likely to choose to hire a consultant

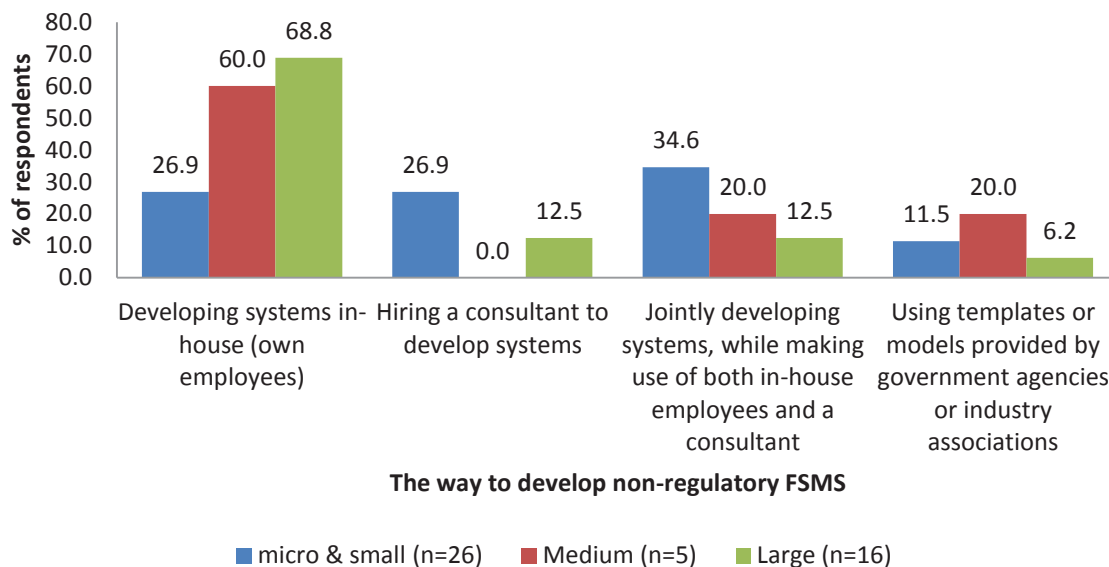
to develop systems. The percentage of respondents who chose to jointly develop systems by making good use of both in-house employees and a consultant was lower for the sub-sector of vegetal products than the other two sub-sectors. No respondents in the sub-sector of vegetal products chose to use templates or models provided by government agencies or industry associations.

In regard to the impact of enterprise size on the way to develop non-regulatory FSMS, the larger the size of the respondents, the more likely they were to develop systems using their own employees (Figure 6.2). There were more medium sized enterprises that chose to use templates or models provided by government agencies or industry associations. Since only five medium sized respondents indicated that they had non-regulatory FSMS in place, this should be viewed with caution. Micro and small sized enterprises were more likely to jointly develop systems by both their own employees and a consultant.

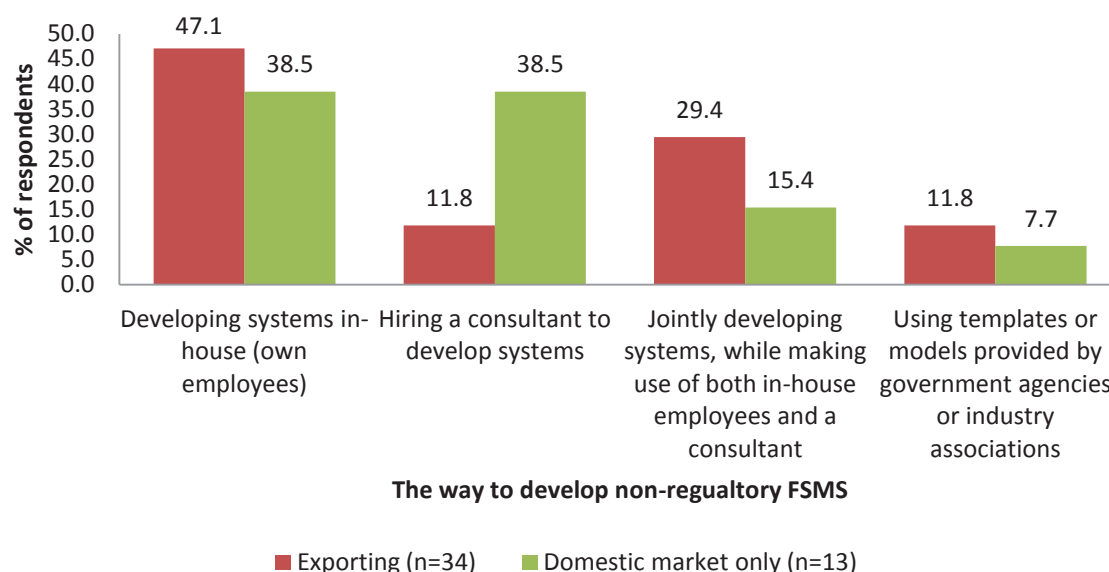
A larger proportion of exporting respondents developed systems using their own employees or using both in-house employees and a consultant. Domestic market suppliers were more likely to hire a consultant to develop systems than exporting food manufacturers (Figure 6.3).



**Figure 6.1: Association between ways to develop non-regulatory FSMS and sub-sectors**



**Figure 6.2: Association between ways to develop non-regulatory FSMS and enterprise size**



**Figure 6.3: Association between ways to develop non-regulatory FSMS and exporting status**

### 6.3 The association between changes as a consequence of the implementation of non-regulatory FSMS and enterprise characteristics

#### 6.3.1 The influence of sub-sectors

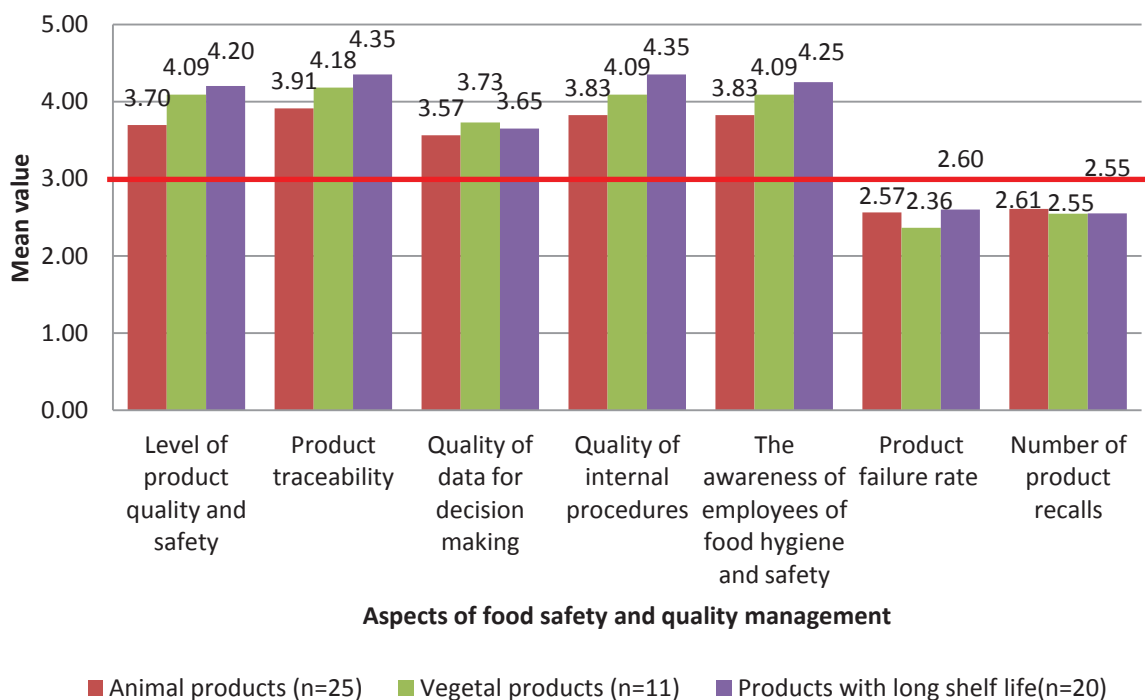
##### 6.3.1.1 Changes in food quality and safety management

Figure 6.4 shows the mean values of changes in different aspects of food quality and safety management of the different sub-sectors. Among the three sub-sectors, the mean values for the sub-sector of animal products were the smallest in terms of “level of product quality and safety”, “product traceability”, “quality of data for decision making”, “quality of internal procedures”, and “the awareness of employees of food hygiene and safety”. Hence, respondents in the sub-sector of animal products felt that they experienced the least noticeable improvement in those five aspects of food safety and quality management after the implementation of non-regulatory FSMS.

Respondents in the sub-sector of products with long shelf life at ambient temperature



felt that they achieved the most notable increase in terms of “level of product quality and safety”, “product traceability”, “quality of internal procedures”, and “the awareness of employees of food hygiene and safety”. The product failure rate decreased the most in respondents in the sub-sector of vegetal products. There were few variations among the three sub-sectors in terms of the change in the number of product recalls.



**Figure 6.4: Mean values of aspects of food quality and safety management for different sub-sectors**

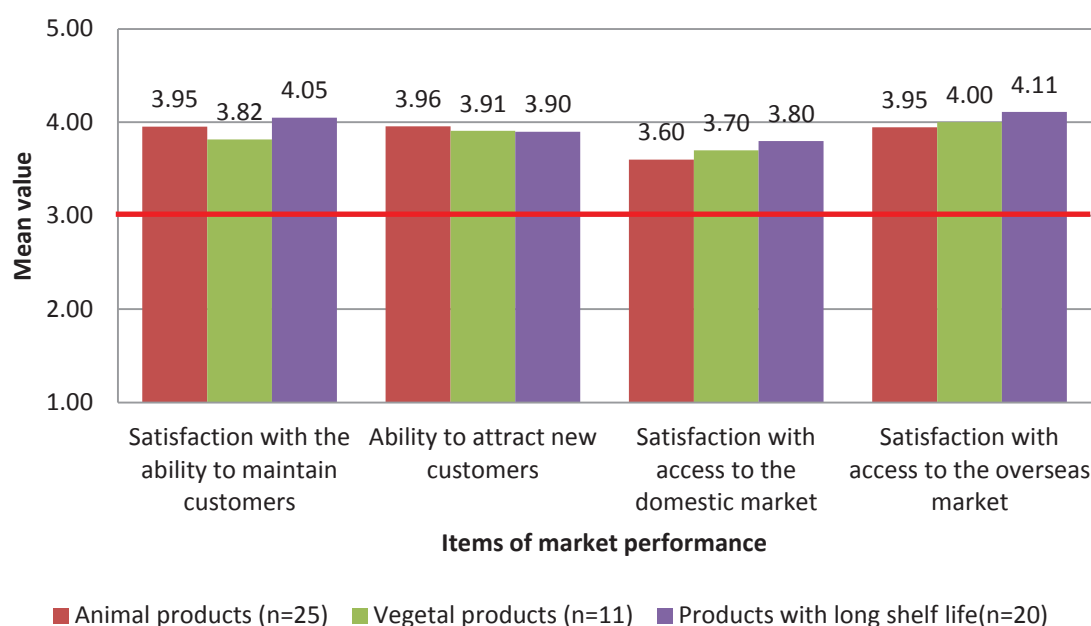
Note: 1 – greatly decreased, 2- slightly decreased, 3 – stayed at the same, 4 – slightly increased, 5 – greatly increased

The results from Cross-Tabulation analysis revealed several statistically significant associations between the sub-sectors and results from changes in food safety and quality management. The association between the sub-sector of animal products and “production traceability” was significant ( $p < 0.05$ ), but the strength of this relationship

was moderate ( $G=-0.429$ ) (Healey, 2012). The relationship between the sub-sector of animal products and “quality of internal procedures” was significant ( $p<0.05$ ), and the strength of this association was strong ( $G=-0.655$ )(Healey, 2012). The association between the sub-sector of animal products and “the awareness of employees of food hygiene and safety” was significant ( $p<0.1$ ), but the strength of this relationship was moderate ( $G=-0.366$ ). The relationship between the sub-sector of vegetal products and “product failure rate” was significant ( $p<0.1$ ), however the strength of this association was relatively weak ( $G=-0.250$ ). The associations between the sub-sector of products with long shelf life at ambient temperature and “level of product quality and safety”, “product traceability” and “quality of data for decision making” were significant ( $p<0.1$ ), however, only the strength of the association between this sub-sector and “level of product quality and safety” was strong ( $G=0.612$ ).

#### **6.3.1.2 Changes in market performance**

The mean values of changes in different aspects of market performance of different sub-sectors are shown in Figure 6.5. Except for the change in the satisfaction with the ability to maintain customers, the mean values of changes in other aspects of market performance did not vary among different sub-sectors. Satisfaction with the ability to maintain customers increased the least in the sub-sector of vegetal products after the implementation of non-regulatory FSMS. The results from Cross-Tabulation analysis did not identify significant associations between the sub-sectors and changes in the market performance following the implementation of non-regulatory FSMS.

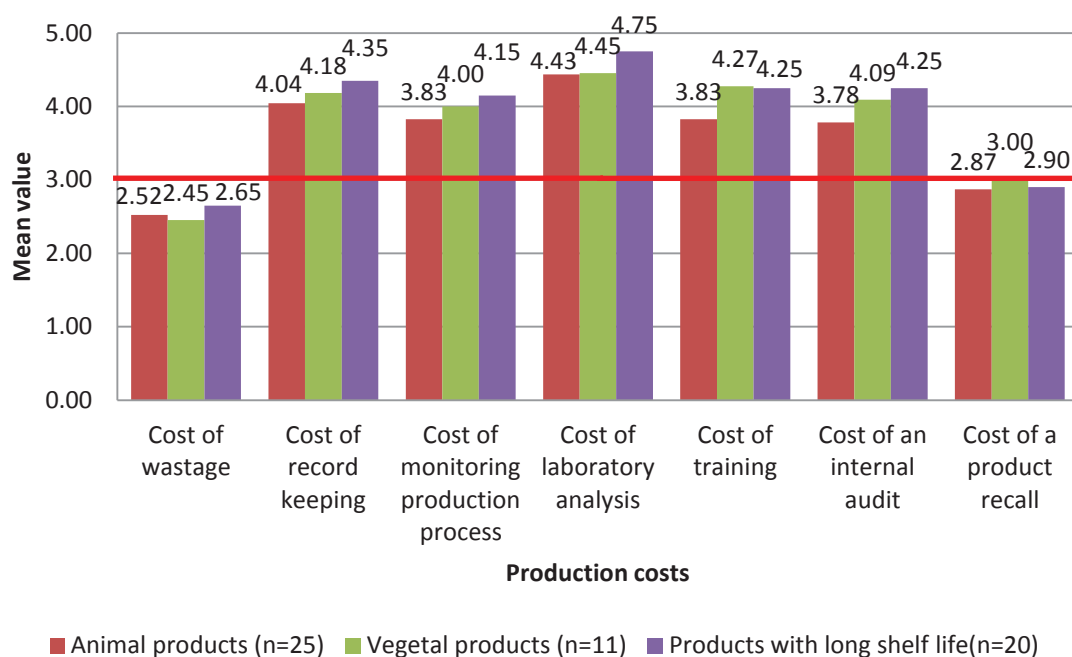


**Figure 6.5: Mean values of items of market performance for different sub-sectors**

Note: 1 – greatly decreased, 2- slightly decreased, 3 – stayed at the same, 4 – slightly increased, 5 – greatly increased

### 6.3.1.3 Changes in production costs

Figure 6.6 shows the mean values of changes in production costs of different sub-sectors. After the implementation of non-regulatory FSMS, respondents in the sub-sector of animal products felt that they experienced only small increases in the costs of record keeping, monitoring production process, laboratory analysis, training, and the internal audit. These costs increased the most in respondents who produced products with a long shelf life at ambient temperature. In terms of changes in the costs of wastage and product recall, there were few variations among different sub-sectors. The results of Cross-Tabulation analysis only revealed a significant association between the sub-sector and changes in production costs. The relationship between the sub-sector of animal products and the change in the cost of training was significant ( $p < 0.10$ ), and the strength of this association was strong ( $G = -0.673$ ).



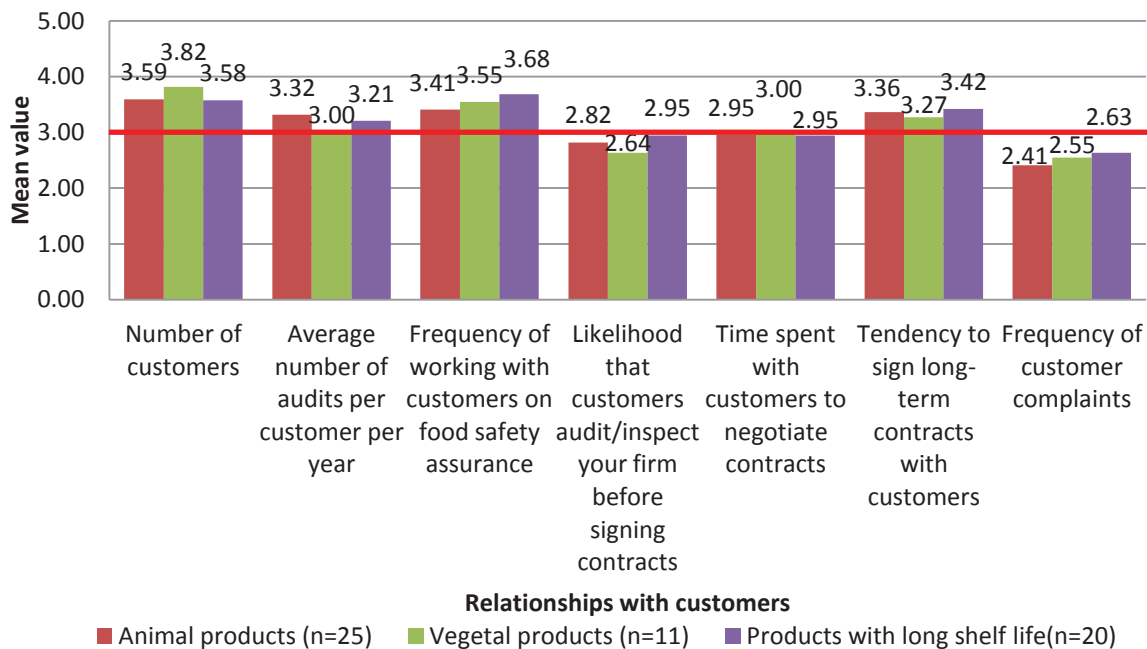
**Figure 6.6: Mean values of changes in production cost of different sub-sectors**

Note: 1 – greatly decreased, 2- slightly decreased, 3 – stayed at the same, 4 – slightly increased, 5 – greatly increased

#### 6.3.1.4 Changes in the relationship with customers

The mean values of changes in different aspects of the relationship with customers of different sub-sectors are illustrated in Figure 6.7. After the implementation of non-regulatory FSMS, the number of customers of respondents in the sub-sector of vegetal products increased more notably than the other two sub-sectors. The average number of audits per customer per year stayed the same in respondents in the sub-sector of vegetal products, while it increased slightly in respondents in the other two sub-sectors. The customers of respondents in the sub-sector of vegetal products were less likely to inspect or audit them before signing contracts. The sub-sectors had fewer impacts on changes in “time spent with customers to negotiate contracts”, “tendency to sign long-term contracts with customers”, and “frequency of customer complaints”.

The results from Cross-Tabulation analysis did not identify any significant association between the sub-sectors and changes in the relationships with customers.



**Figure 6.7: Mean values of changes in the relationship with customers of different sub-sectors**

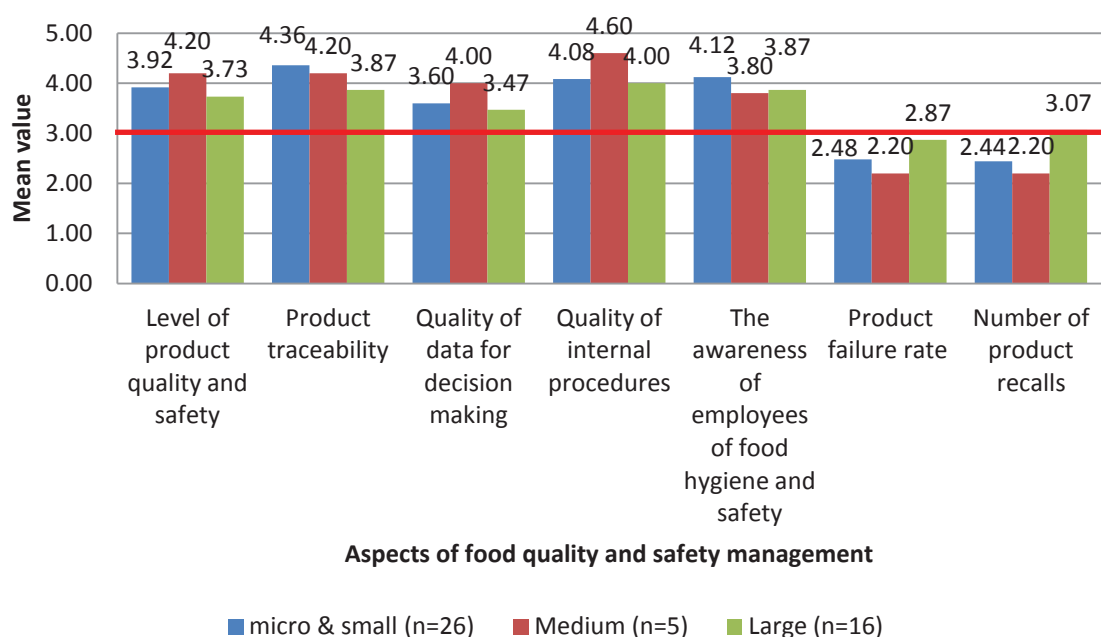
Note: 1 – greatly decreased, 2- slightly decreased, 3 – stayed at the same, 4 – slightly increased, 5 – greatly increased

### 6.3.2 The influence of enterprise size

#### 6.3.2.1 Changes in food quality and safety management

Figure 6.8 shows the mean values of changes in food quality and safety management of different enterprises dependent on size. The medium sized respondents achieved the most notable improvement in product quality and safety after the implementation of non-regulatory FSMS. Product traceability increased most notably in micro and small sized respondents. The micro & small, and medium sized respondents experienced more improvement in the quality of data for decision making. The medium sized respondents improved their internal procedures more substantially than

others. There were few variations in the change in quality of internal procedures between micro and small, and large sized groups. The micro and small sized respondents achieved the most notable improvement in the awareness of employees towards food hygiene and safety. The product failure rate and the number of product recalls decreased more in the medium-sized respondents than others. The number of product recalls did not change in the large sized respondents. The results from Cross-Tabulation analysis revealed a statistically significant association between the enterprise size and changes in food quality and safety management. The association between the size and the change in the number of product recalls was significant ( $p < 0.05$ ), and the strength of this relationship was strong ( $G = 0.696$ ).



**Figure 6.8: Mean values of changes in food quality and safety management of different sized enterprises**

Note: 1 – greatly decreased, 2- slightly decreased, 3 – stayed at the same, 4 – slightly increased, 5 – greatly increased

### 6.3.2.2 Changes in market performance

The mean values for changes in different aspects of market performance for different enterprise sizes are shown in Figure 6.9. After the implementation of non-regulatory FSMS, the improvements in the four aspects of market performance were much more substantial in the micro and small, and medium sized respondents. The results from Cross-Tabulation analysis did not identify significant associations between the enterprise size and changes in market performance.



**Figure 6.9: Mean values of changes in market performance of different enterprise size groups**

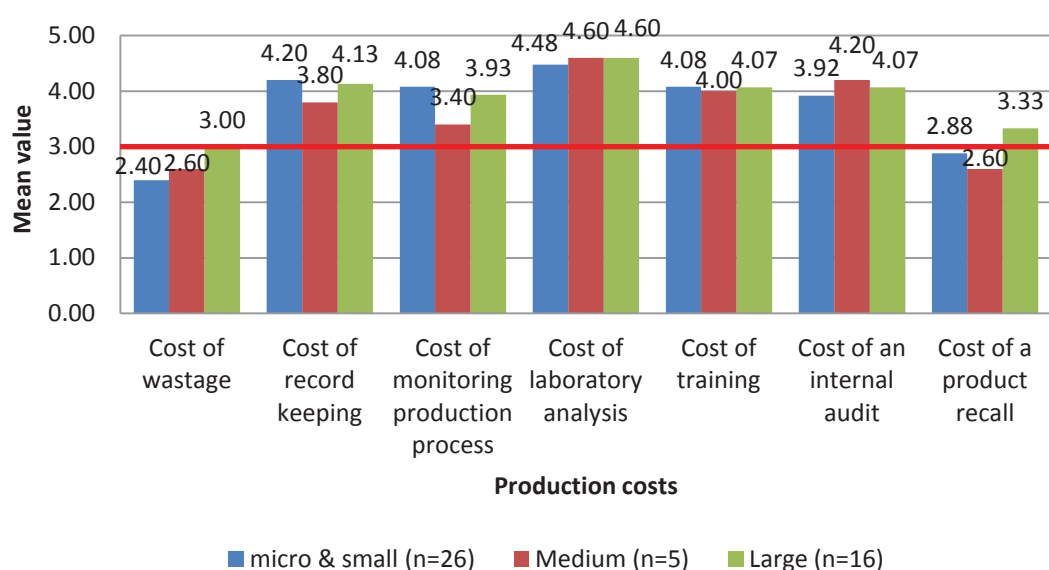
Note: 1 – greatly decreased, 2- slightly decreased, 3 – stayed at the same, 4 – slightly increased, 5 – greatly increased

### 6.3.2.3 Changes in production costs

Figure 6.10 looks at the mean values for changes in the production costs of different sized groups. The cost of wastage decreased most for the micro and small sized group following the implementation of non-regulatory FSMS. The costs of record keeping and monitoring production processes increased more in micro & small and large sized

respondents. There were few variations among the mean values for the micro and small, medium and large sized groups in terms of changes in the costs of laboratory analysis, training and internal audits. The cost of product recall slightly increased in large sized respondents, while it remained the same or decreased in other sized respondents.

The results from Cross-Tabulation analysis revealed a statistically significant association between the enterprise size and changes in the production costs. The association between the change in the cost of product recall and enterprise size was significant ( $p < 0.05$ ) and the strength of this relationship was moderate as the value of Gamma was 0.347.



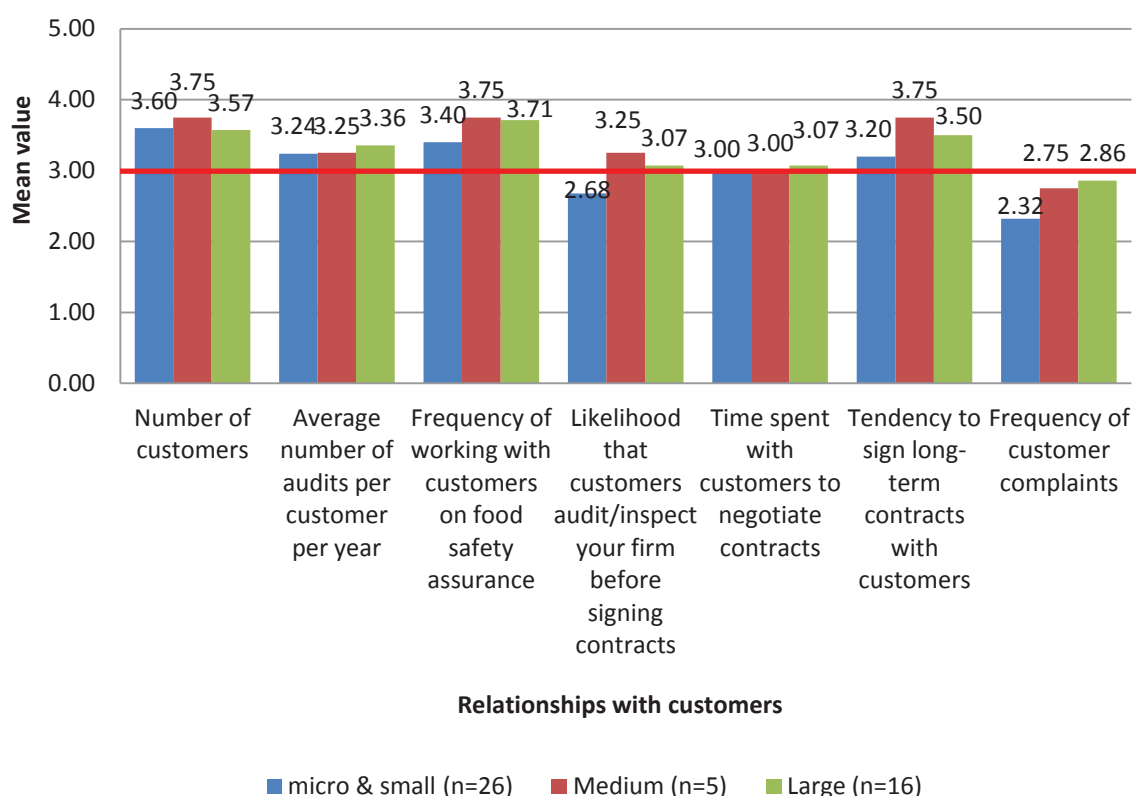
**Figure 6.10: Mean values of changes in production costs of different enterprise size groups**

Note: 1 – greatly decreased, 2- slightly decreased, 3 – stayed at the same, 4 – slightly increased, 5 – greatly increased



#### **6.3.2.4 Changes in the relationship with customers**

The mean values for changes in different aspects of the relationships with customers for different sized enterprises are shown in Figure 6.11. After the implementation of non-regulatory schemes, medium and large sized respondents worked more frequently with customers on food safety assurance. Customers of micro and small sized respondents were less likely to audit/inspect them before signing contracts. The enterprise size had no impact on changes in “number of customers”, “average number of audits per customer per year”, and “time spent with customers to negotiate contracts”. Medium sized respondents were more likely to sign long-term contracts with customers following the implementation of non-regulatory FSMS. Micro and small sized respondents achieved the most notable decrease in the frequency of customer complaints. The results from Cross-Tabulation analysis only revealed a statistically significant association between the enterprise size and changes in the relationships with customers. The association between changes in time spent with customers to negotiate contracts and enterprise size was significant ( $p < 0.05$ ), but the strength of this relationship was very weak ( $G = 0.05$ ).



**Figure 6.11: Mean values of changes in the relationship with customers of different enterprise size groups**

Note: 1 – greatly decreased, 2- slightly decreased, 3 – stayed at the same, 4 – slightly increased, 5 – greatly increased

### 6.3.3 The influence of exporting status

#### 6.3.3.1 Changes in food quality and safety management

Figure 6.12 shows the mean values of changes in food quality and safety management of respondents with different exporting status. Following the implementation of non-regulatory FSMS, the domestic market focused respondents achieved greater improvement in product quality and safety, product traceability, and quality of data for decision making. Enterprise's exporting status had no impact on changes in the quality of internal procedures, the awareness of employees of food hygiene and safety,

product failure rate and the number of product recalls, as there were few variations in the mean values for both groups.

The results from Cross-Tabulation analysis only revealed two statistically significant associations between the exporting status and changes in food quality and safety management. The association between the change in the level of product quality and safety and exporting status was significant ( $p < 0.10$ ), and the strength of this relationship was moderate ( $G = -0.354$ ). Although the association between the change in product traceability and exporting status was significant ( $p < 0.10$ ), the strength of this relationship was relatively weak ( $G = -0.263$ ).



**Figure 6.12: Mean values of changes in food quality and safety management of different exporting status groups**

Note: 1 – greatly decreased, 2- slightly decreased, 3 – stayed at the same, 4 – slightly increased, 5 – greatly increased

### 6.3.3.2 Changes in market performance

The mean values of changes in different aspects of market performance for different exporting status are shown in Figure 6.13. Enterprise' exporting status had little influence on the change in the ability to maintain customers, since the mean values of both groups were similar. Exporting respondents improved their ability to attract new customers and to have access to overseas markets after the implementation of non-regulatory FSMS. As expected, the domestic market focused respondents were more satisfied with access to the domestic market.



**Figure 6.13: Mean values of changes in market performance of different exporting status groups**

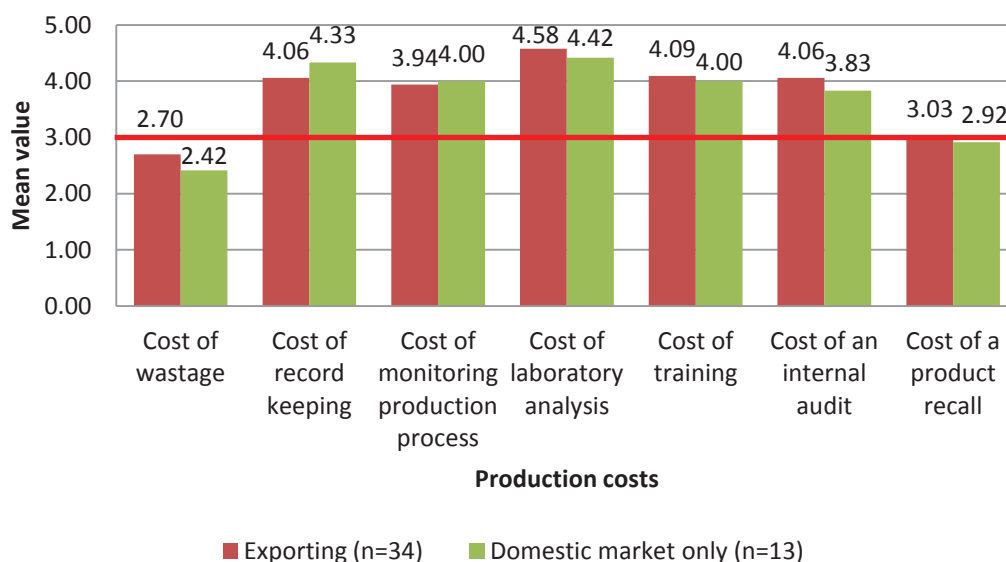
Note: 1 – greatly decreased, 2- slightly decreased, 3 – stayed at the same, 4 – slightly increased, 5 – greatly increased

The results from Cross-Tabulation analysis only revealed a statistically significant association between the exporting status and changes in market performance. The relationship between the exporting status and the change in satisfaction with access to

the overseas market was significant ( $p < 0.05$ ), and the strength of this association was strong ( $G = 0.643$ ).

### 6.3.3.3 Changes in production cost

Figure 6.14 looks at the mean values of changes in production costs for groups of different exporting status. The cost of wastage decreased most in domestic market focused respondents following the implementation of non-regulatory FSMS. The cost of record keeping increased the most in the domestic market focused respondents. The exporting status had no or little influence on changes in the costs of monitoring the production process, laboratory analysis, training, an internal audit and a production recall, as there were no or few variations between the mean values for both groups. The results from the Cross-Tabulation analysis did not identify significant associations between the enterprise size and changes in market performance.

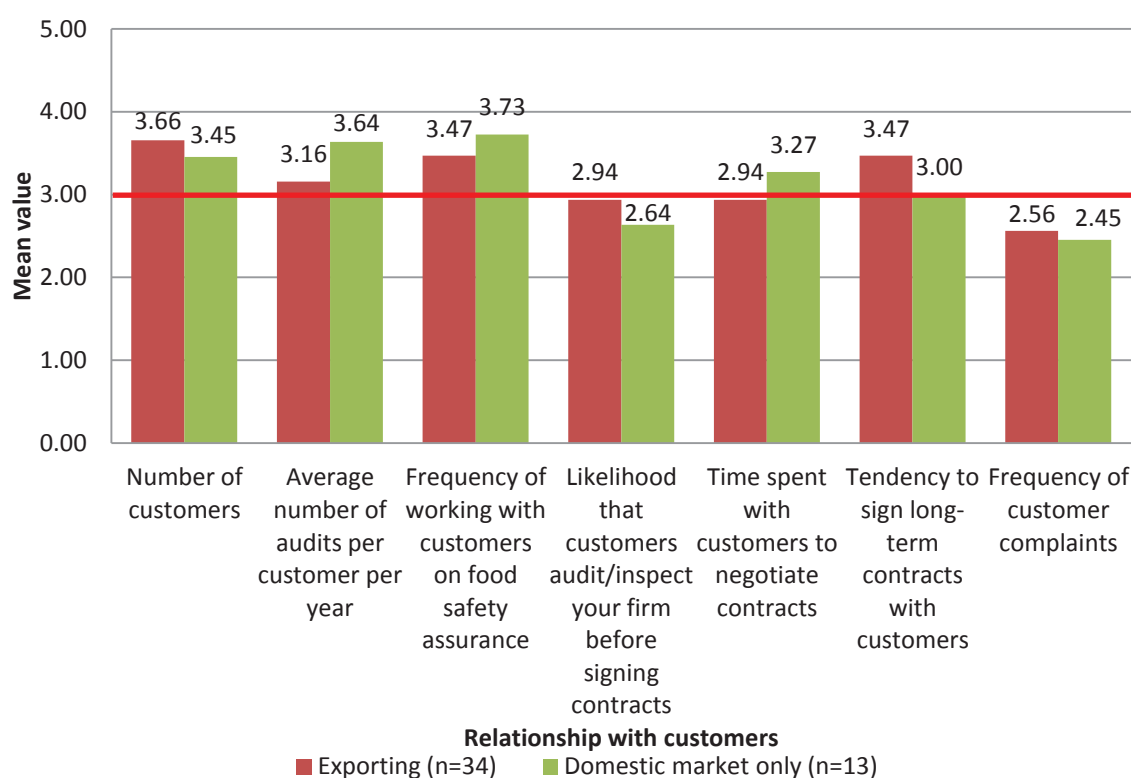


**Figure 6.14: Mean values of changes in production costs of different exporting status groups**

Note: 1 – greatly decreased, 2- slightly decreased, 3 – stayed at the same, 4 – slightly increased, 5 – greatly increased

#### **6.3.3.4 Changes in the relationship with customers**

The mean values for changes in different aspects of the relationship with customers for the different exporting status firms are shown in Figure 6.15. The customers of exporting respondents increased most after the implementation of non-regulatory FSMS. The average number of audits per customer per year increased most in the domestic market focused respondents. They also worked more frequently with customers on food safety assurance and spent more time with customers to negotiate contracts. Customers of domestic market focused respondents were less likely to audit/inspect them before signing. Exporting respondents were more likely to sign long-term contracts with customers. The exporting status had no or little influence on the change in the frequency of customer complaints. The results from Cross-Tabulation analysis only revealed a statistically significant association between the exporting status and changes in relationships with customers. The association between the exporting status and the change in the tendency to sign long-term contracts with customers was significant ( $p < 0.10$ ), and the strength of this association was strong ( $G = 0.797$ ).



**Figure 6.15: Mean values of changes in the relationship with customers of different exporting status groups**

Note: 1 – greatly decreased, 2- slightly decreased, 3 – stayed at the same, 4 – slightly increased, 5 – greatly increased

## 6.4 The association between the challenges during the implementation of non-regulatory FSMS and enterprise characteristics

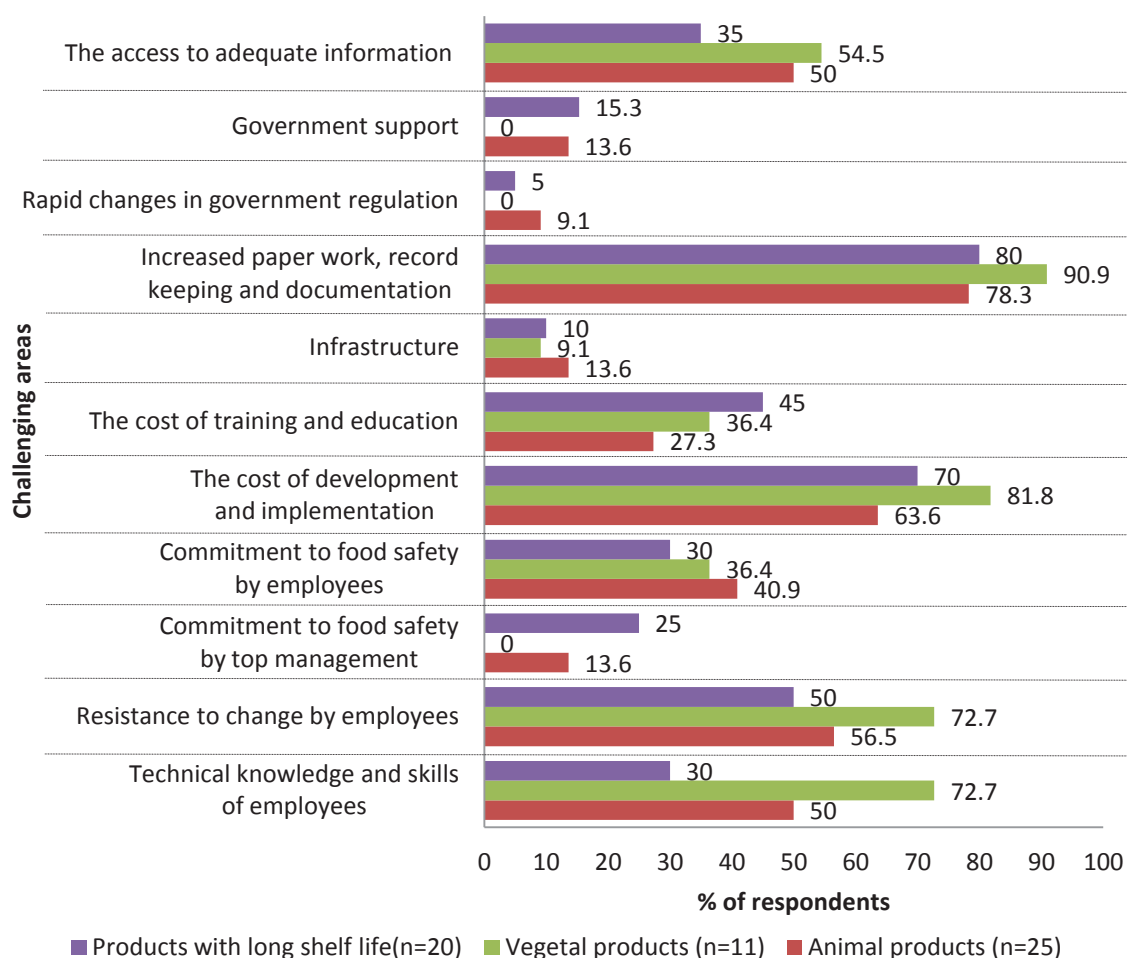
### 6.4.1 Influence of sub-sectors

Figure 6.16 illustrates the percentage of respondents from the different sub-sectors who met challenges in eleven areas during the implementation of non-regulatory FSMS. During the implementation of non-regulatory FSMS, a larger proportion of respondents in the sub-sector of vegetal products met challenges in the areas of “technical knowledge and skills of employees”, “resistance to change by employees”, “the cost of development and implementation”, “increased paper work, record keeping and documentation”, and “the access to adequate information”. The

percentages of respondents in the sub-sector of products with long shelf life at ambient temperature who met challenges in the areas of “commitment to food safety by top management”, “the cost of training and education”, and “government support” were larger than the categories of vegetal or animal products. A large proportion of respondents in the sub-sector of animal products encountered challenges in the fields of “commitment to food safety by employees”, “infrastructure”, and “rapid changes in government regulation”. Respondents in the sub-sector of vegetal products indicated that they did not meet challenges in the areas of “commitment to food safety by top management”, “rapid changes in government regulation”, and “government support”. Although the sub-sector had an impact on whether respondents met challenges in certain challenging areas, the six most challenging areas were the same for all three sub-sectors.

The results from Cross-Tabulation analysis only revealed two statistically significant associations between the challenging areas and sub-sectors. The relationship between the sub-sector of animal products and “the cost of training and education” was significant ( $p < 0.10$ ), and the strength of this association was moderate ( $\phi = -0.277$ ). The association between the sub-sector of products with long shelf life at ambient temperature and “technical knowledge and skills of employees” was significant ( $p < 0.05$ ), and the strength of this relationship was strong ( $\phi = -0.365$ ).



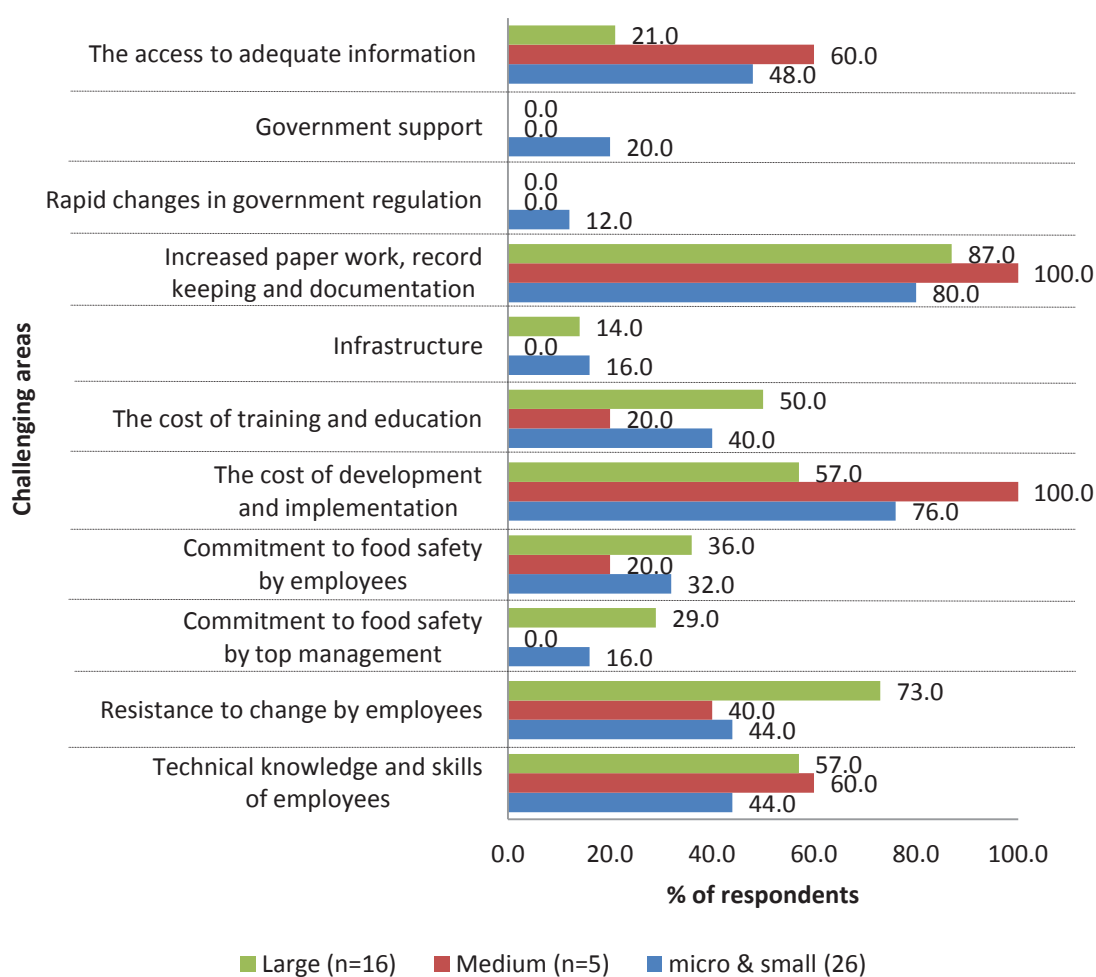


**Figure 6.16: Association between challenging areas and sub-sectors**

#### 6.4.2 Influence of size

The percentage of respondents from different sized groups, who met challenges in eleven areas during the implementation of non-regulatory FSMS, are shown in Figure 6.17. A large proportion of medium sized respondents met challenges in the areas of “technical knowledge and skills of employees”, “the cost of development and implementation”, “increased paper work, record keeping and documentation”, and “the access to adequate information”. Compared to the other two sized respondents, large sized respondents were more likely to meet challenges in areas of “resistance to change by employees”, “commitment to food safety by top management”, and “the cost of training and education”. Micro and small sized respondents were apt to have

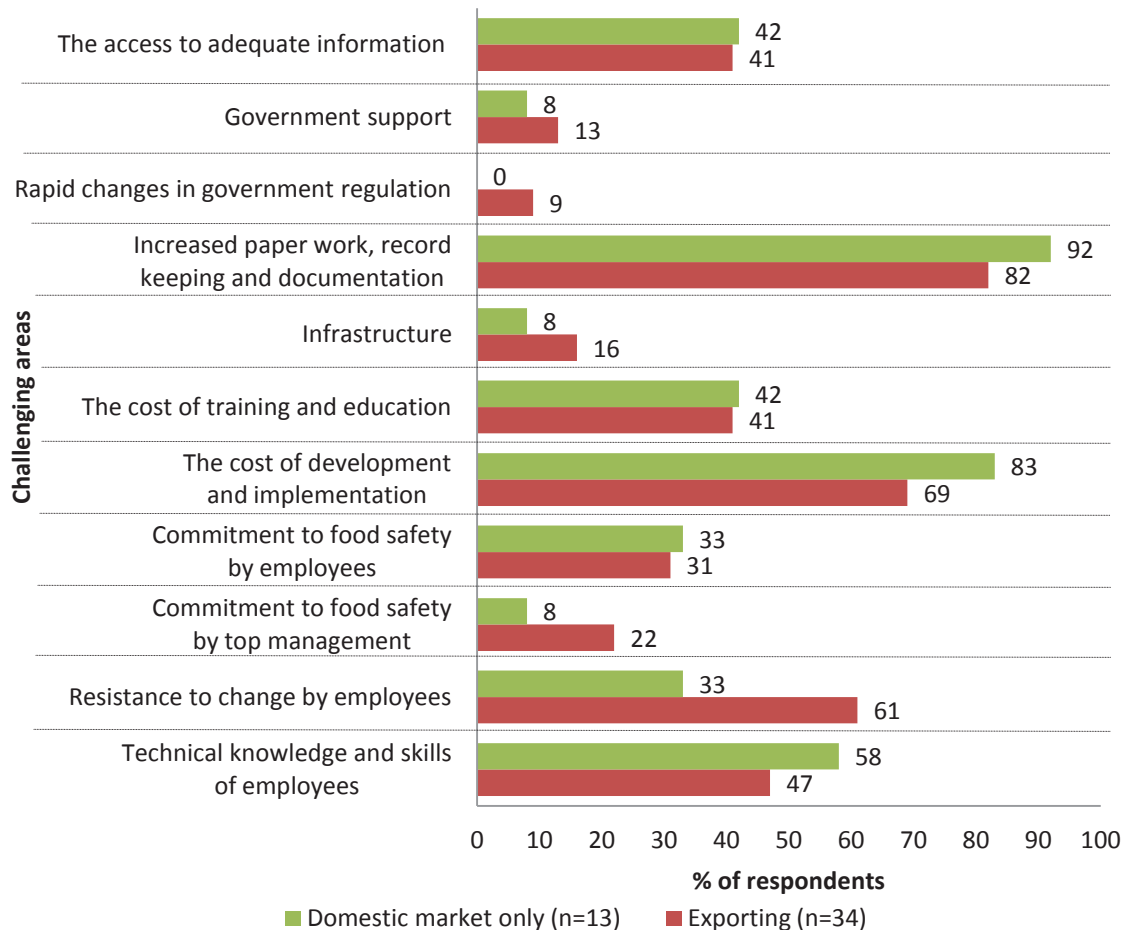
difficulties in areas of “infrastructure”, “rapid changes in government regulation”, and “government support”. No medium sized respondents met challenges in areas of “commitment to food safety by top management” and “infrastructure”. In areas of “rapid changes in government regulation” and “government support”, no medium and large sized respondents had difficulties. Although the enterprise size had an impact on whether respondents met challenges in certain challenging areas, the six most challenging areas were the same for all three size groups. The results from Cross-Tabulation analysis did not reveal any statistically significant associations between the challenging areas and enterprise size.



**Figure 6.17: Association between challenging areas and enterprise size**

### 6.4.3 Influence of exporting status

Figure 6.18 illustrates the percentage of respondents of different exporting status who met challenges in eleven areas during the implementation of non-regulatory FSMS. In terms of “technical knowledge and skills of employees”, “the cost of development”, and “increased paper work, record keeping and documentation”, the percentage of domestic market focused respondents who met challenges was larger than those of the exporting group. On the contrary, the percentage of exporting respondents who met the challenges were larger than those of the domestic market focused group in areas of “resistance to change by employees”, “commitment to food safety by top management”, “infrastructure”, and “government support”. There were few variations between the percentages of domestic market focused and exporting respondents who met the challenges in the areas of “commitment to food safety by employees”, “the cost of training and education”, and “the access to adequate information”. No domestic market focused respondents experienced challenges in the area of “rapid changes in government regulation”. Although the exporting status had an impact on whether respondents met challenges in certain areas, the six most challenging areas were the same for both exporting and domestic market focused respondents. The results from Cross-Tabulation analysis did not reveal any statistically significant associations between the challenging areas and the exporting status.



**Figure 6.18: Association between challenging areas and exporting status**

## 6.5 Discussion and Conclusions

This chapter investigates the impact of enterprise demographics on food manufacturing enterprise’s experiences (strategies, changes and challenges) of non-regulatory FSMS in New Zealand. Enterprise attributes included in the analysis were the sub-sector of the food manufacturing industry, size and exporting status. The analysis revealed that such demographics influenced the food manufacturing enterprise’s experiences of non-regulatory FSMS. This has not been reported previously.

During the implementation of non-regulatory FSMS, different strategies were chosen by respondents with different attributes, to develop their systems. The human

resources differ in different enterprises. Larger sized enterprises have an advantage in being able to hire and retain technically competent and experienced employees. They are then in a position to develop their systems in house. In the food manufacturing industry of New Zealand, the sub-sector of “animal products” is more developed than the other two sub-sectors. There are more experienced employees in enterprises in the sub-sector of animal products than the other two sub-sectors. Therefore they can develop their system by using their own employees.

The sub-sector had more impact on changes in food safety and quality management and production costs following the implementation of non-regulatory FSMS, while it had little impact on changes in the market performance and relationships with customers. In New Zealand, the regulatory environments are different for different sub-sectors of the food manufacturing industry. The regulating system for the sub-sector of animal products is more stringent than those of the other two sub-sectors. In New Zealand, the sub-sector of “animal products” is regulated under the Animal Product Act 1999, while the sub-sectors of “vegetal products” and “products with long shelf life at ambient temperature” are regulated under the Food Act 1981. The requirements of the Animal Product Act 1999 are more stringent than those of the Food Act 1981. The sub-sector of animal products is also more mature and developed than the other sub-sectors. For instance, the dairy industry is world-leading in process technology, and a risk-based food safety management system is in place (Archer, 2013). Most enterprises in this sub-sector were relatively experienced in the field of food safety and quality management, and had invested more in food safety and quality management before the implementation of non-regulatory FSMS than other enterprises. Hence, these enterprises experienced less notable changes in food safety

and quality management and production costs. Many non-regulatory FSMS are requirements from major customers. Changes in the market performance and relationships with customers did not vary among different sub-sectors.

The enterprise size had notable influences on changes in food safety and quality management and market performance, while it had less notable impact on changes in production costs and customer relationships. Large sized respondents experienced less notable changes in food safety and quality management and market performance following the implementation of non-regulatory FSMS. This may be explained by the fact that a larger food enterprise has a lot more to lose from a food safety incident, and will have more resources than a smaller enterprise. Thus, large sized enterprises are likely to invest in food safety and quality management even if they do not implement non-regulatory FSMS. The implementation of non-regulatory FSMS will therefore have less of impact on these large enterprises compared with medium and small sized enterprises.

The exporting status had some impact on changes in food safety and quality management and market performance. Domestic market focused respondents experienced more substantial improvements in food safety and quality management than the export focused enterprises. Exporting respondents improved their ability to attract new customers and to have access to overseas markets, while domestic market focused respondents were more satisfied with access to the domestic market.

Enterprise attributes had an impact on whether respondents met challenges in certain areas; however, the six most challenging areas were the same for each category.

Although the financial and human resources differed in different enterprises, most of them faced similar challenges during the implementation of non-regulatory FSMS.

Taken together, these empirical research findings help explain why enterprise characteristics have a notable impact on the propensity of food manufacturing enterprises to implement non-regulatory FSMS in New Zealand. To my knowledge, this is the first time that the influence of these enterprise demographics on the experience of non-regulatory FSMS has been investigated. It provided clear information on the implementation process of these non-regulatory schemes, such as what kinds of benefits can be achieved through implementation and what kinds of difficulties and challenges can be expected for a certain group of enterprises.

Scheme owners should maximize the incentives for food enterprises to implement these schemes and minimize or even mitigate the barriers. For example, more user-friendly standards should be compiled to decrease the cost of implementation in smaller sized enterprises. These findings can also be included in the risk assessment of different types of food manufacturing enterprises when third-party certification bodies decide to adopt a risk oriented auditing practice in order to improve the audit quality.

## CHAPTER 7 QUALITY OF THIRD-PARTY FOOD SAFETY AUDITS

### 7.1 Introduction

As an effective tool of enforcement, third-party audits have been involved in non-regulatory food safety management schemes (FSMS) since their first introduction. According to ISO/IEC (2004, p. 12), an audit is a “systematic, independent, documented process for obtaining records, statements of fact or other relevant information and assessing them objectively to determine the extent to which specified requirements are fulfilled”. It combines many audit techniques such as documentation review, observation of the workplace, and employee interviews. Third-party audits are conducted by certification bodies in the form of certification. Certification is “third-party attestation related to products, processes, systems or persons” (ISO/IEC, 2004, p. 14). A certification body is a third-party that conducts certification activities, such as audit and inspection, and issues the certificate to producers and other organisations. Third-party certification bodies provide certification services to verify or confirm the conformity with non-regulatory food safety management schemes (Busch et al., 2005; Henson, 2007). Certification bodies are not connected with the person or organisation that provides products or services (first party), and have no user interests in those products or services (second party).

In my survey of non-regulatory food safety management in the New Zealand food manufacturing industry, 66% of respondents indicated that the third-party certification bodies’ service was important for them to continuously improve their food safety management. The quality of third-party food safety audits was identified by respondents as an important factor which could impinge on the effectiveness of non-



regulatory FSMS. The quality of audits carried out by third parties has also been of concern (Albersmeier et al., 2009; Albersmeier et al., 2010; Anders et al., 2010; Holger et al., 2006; Jahn et al., 2004a; Karapetrovic & Willborn, 2000; D. A. Powell et al., 2013).

In this chapter, based on the document analysis of non-regulatory schemes and the results of my survey among certification bodies in New Zealand, the role of third party audits in the implementation of non-regulatory FSMS is first analysed, then the certification processes of different types of schemes are investigated. Factors influencing audit quality are examined and ways to improve the quality of third-party audits are proposed.

## **7.2 Role of third-party audits during implementing non-regulatory food safety management schemes in food manufacturing enterprises**

### **7.2.1 The operational system of non-regulatory food safety management schemes**

Third-party certification bodies have played an important role in the verification and assessment of most non-regulatory food safety schemes through their business of certification and supply chain audits (Hatanaka et al., 2005). Figure 2.4 illustrates the relationships among different stakeholders in relation to the non-regulatory food safety scheme involving third-party certification. Scheme owners can be a government agency or in the private sector. Generally, there is a national accreditation body in most countries, and the accreditation body is generally authorized by government agencies to perform accreditation activities (ISO/IEC, 2004). In New Zealand, the Joint Accreditation System of Australia & New Zealand (JAS-ANZ) is the accreditation body authorized by the government to provide an accreditation service to certification bodies. Most accreditation bodies are members of the International Accreditation

Forum (IAF), which is the world association of conformity assessment accreditation Bodies (Hatanaka & Busch, 2008), and are peer reviewed by IAF.

For most non-regulatory FSMS, certification bodies have to be approved by the scheme owner to provide relevant certification services. Auditors should be registered by personnel certification bodies (RABSQA International, in New Zealand) or scheme owners. Certification bodies are required to be accredited by certain accreditation bodies. Accreditation bodies may have to be recognized by the scheme owners to offer accreditation services for the scope of these schemes. For example, accreditation bodies should be approved by the British Retailer Consortium (BRC) to offer accreditation for the BRC Global Standard for Food Safety to certification bodies against ISO/IEC Guide 65/EN4501 general requirements for bodies operating product certification systems.

Some stakeholders are not involved in certain non-regulatory FSMS, such as scheme owners, accreditation bodies and IAF. These stakeholders are in dotted text boxes in Figure 2.4 In the case of ISO 22000, there is no scheme owner. Without any approval or registration, certification bodies can offer the service of ISO 22000 certification once they hire enough competent auditors. Meanwhile, they often seek accreditation to demonstrate their independence and objectivity to stakeholders.

As certification bodies are organisationally independent from both food manufacturers and buyers, third-party audits are of paramount importance to monitor and enforce food safety standards throughout the food supply chain. They can provide assurance of the consistent implementation of food safety standards regardless of different food manufacturing enterprises (Hatanaka et al., 2005). Non-regulatory FSMS are

ineffective without any enforcement institutions. These audits provide assurances about the level of food safety to stakeholders along the food supply chain by providing information about the conformity of food manufacturers against certain non-regulatory FSMS. The independence, objectivity and transparency of certification bodies could increase trust and legitimacy of third-party audits. These characteristics of certification bodies are regarded as necessary for the effective enforcement of food safety management along the food supply chain (Deaton, 2004; Tanner, 2000).

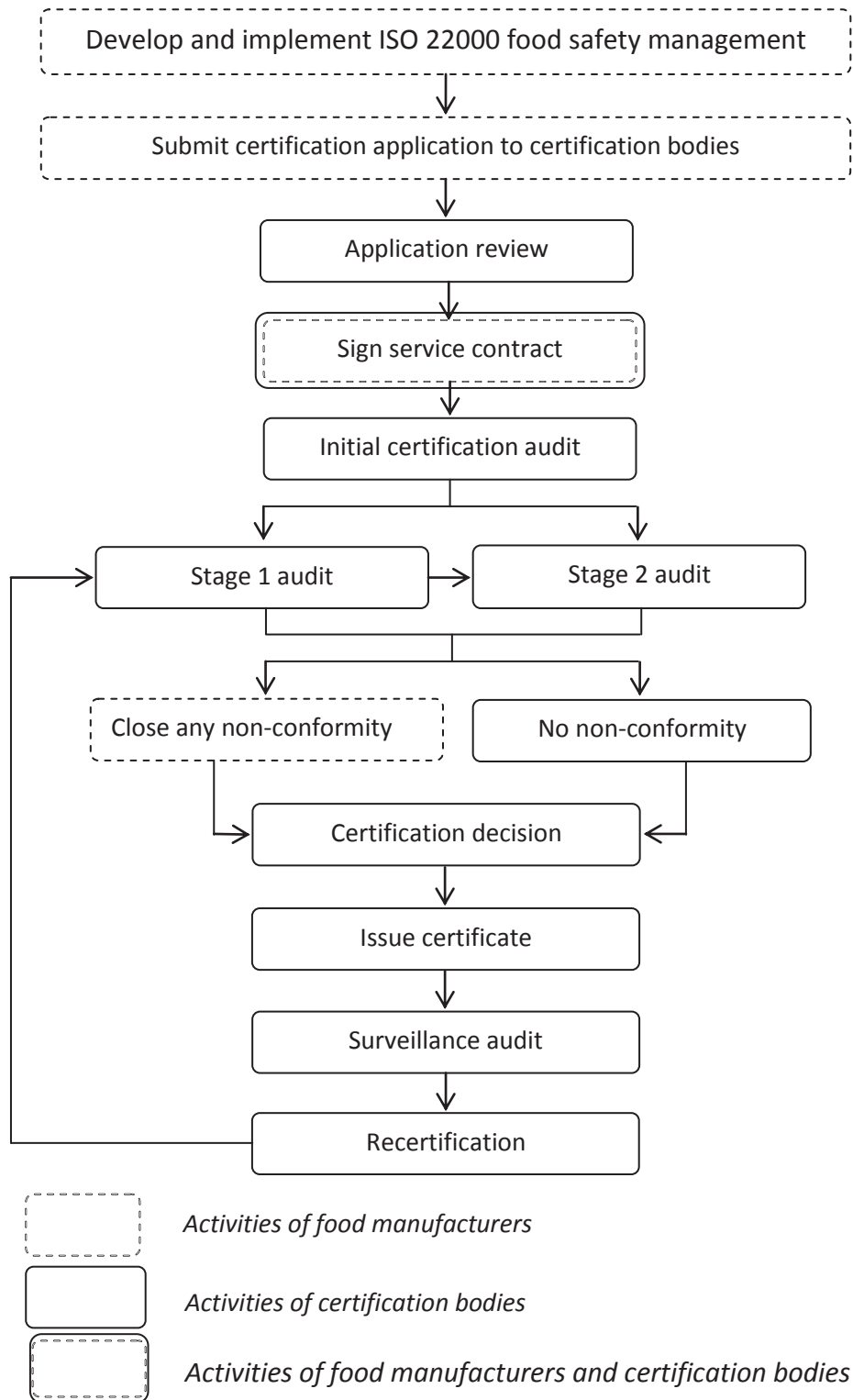
Through the involvement of third-party audits, the responsibility of buyers or retailers to ensure food safety is partly transferred to certification bodies as these bodies are largely responsible for monitoring the implementation of non-regulatory FSMS. It also helps the buyers or retailers to shift the cost of food safety audits to food manufacturing enterprises since all the cost of third-party audits are borne by these enterprises.

#### **7.2.2 Certification process of non-regulatory food safety management schemes**

In my survey of non-regulatory food safety management in the New Zealand food manufacturing industry, seventeen non-regulatory FSMS have been implemented by the food manufacturing industry. These schemes can be categorized into three broad groups: public international standard schemes, public industry sector schemes and private individual firm schemes. Certification bodies of some schemes are required to be accredited by a certain accreditation body, while others are not. The certification processes of these schemes are different. Figure 7.1 illustrates the certification process of the ISO 22000 Food Safety Management System, which is typical for the public international standard. The certification process for the BRC Global Standard for Food

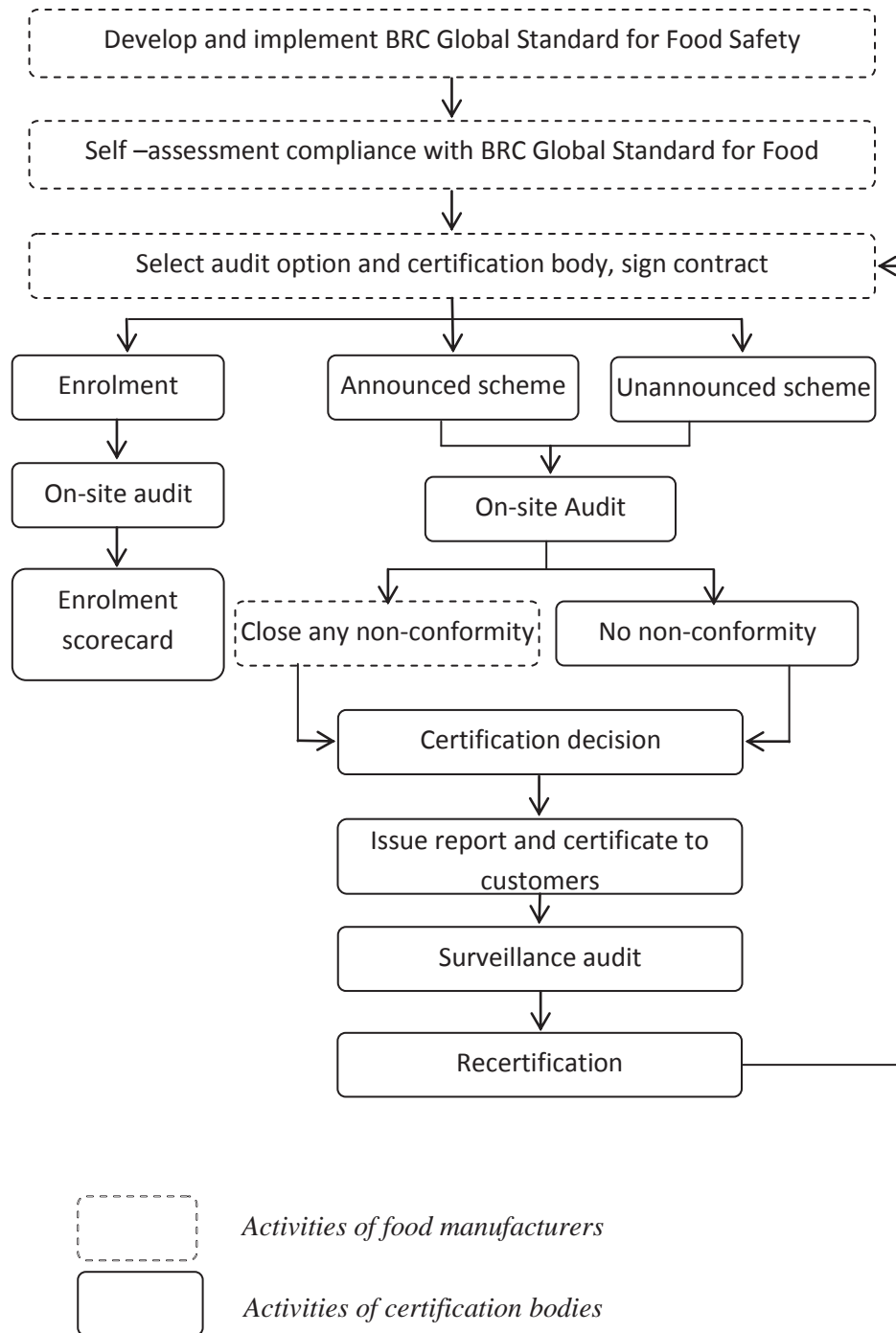
Safety is shown in Figure 7.2. The BRC Global Standard for Food Safety is representative of the public industry sector schemes. Figure 7.3 shows the certification process for the Woolworths Quality Assurance (WQA) which is a typical private individual firm scheme in New Zealand.

There are similarities among these three certification processes. Food manufacturing enterprises have to implement relevant standards, be audited by certification bodies, take corrective actions to close any non-conformity and keep ongoing compliance to relevant requirements. During the period for which the certificate is valid, certification bodies should conduct surveillance activities to assess the ongoing conformity of the food manufacturing enterprises. Compared to the other two schemes, Woolworths Limited, the scheme owner of WQA, is much more involved in the certification process. Food manufacturing enterprises can only be invited into the WQA programme by Woolworths Limited. Certification bodies are also nominated by Woolworths Limited, although food enterprises are entitled to ask Woolworths Limited to nominate another certification body if they are not satisfied with the first nomination. Instead of certification bodies, Woolworths Limited makes certification decisions and issues certificates to food enterprises.



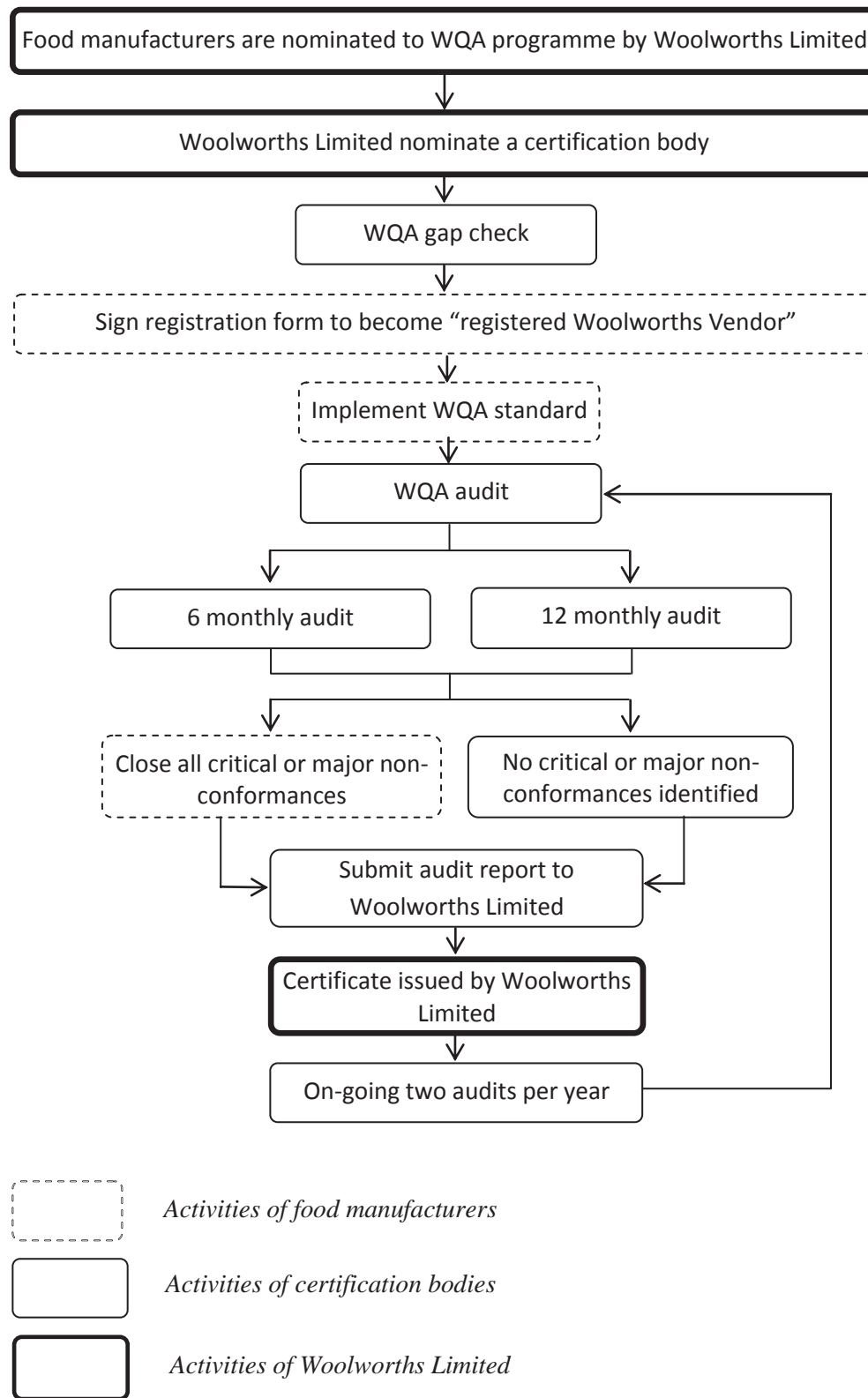
**Figure 7.1: Certification process of the ISO 22000 Food Safety Management System**

*Source: Author's elaboration based on document analysis*



**Figure 7.2: Certification process for the BRC Global Standard for Food Safety**

*Source: Author's elaboration based on document analysis*



**Figure 7.3: Certification process of the WQA programme**

*Source: Author's elaboration based on document analysis*

### **7.3 Factors influencing audit quality**

In order to ensure the quality of audits, certification bodies are required to be independent, objective and competent. The independence and objectiveness of third-party certification bodies and the reliability of third-party certification are of concern (Albersmeier et al., 2009; Hatanaka & Busch, 2008). Certification bodies are independent from other stakeholders, such as retailers and suppliers, in the non-regulatory FSMS system. However, it is argued that third-party certification bodies are organisationally but not operationally objective and independent, and that they are involved in the social, political and economic context of society (Hatanaka & Busch, 2008). Most non-regulatory schemes have control measures in place to ensure the independence and objectivity of certification bodies and to monitor their performance. Table 7.1 summarises the enforcement measures of ISO 22000, BRC and WQA. In my survey among certification bodies in New Zealand, respondents were asked to indicate the importance of different factors their independence and objectiveness.



**Table 7.1: Enforcement measures for ISO 22000, BRC and WQA**

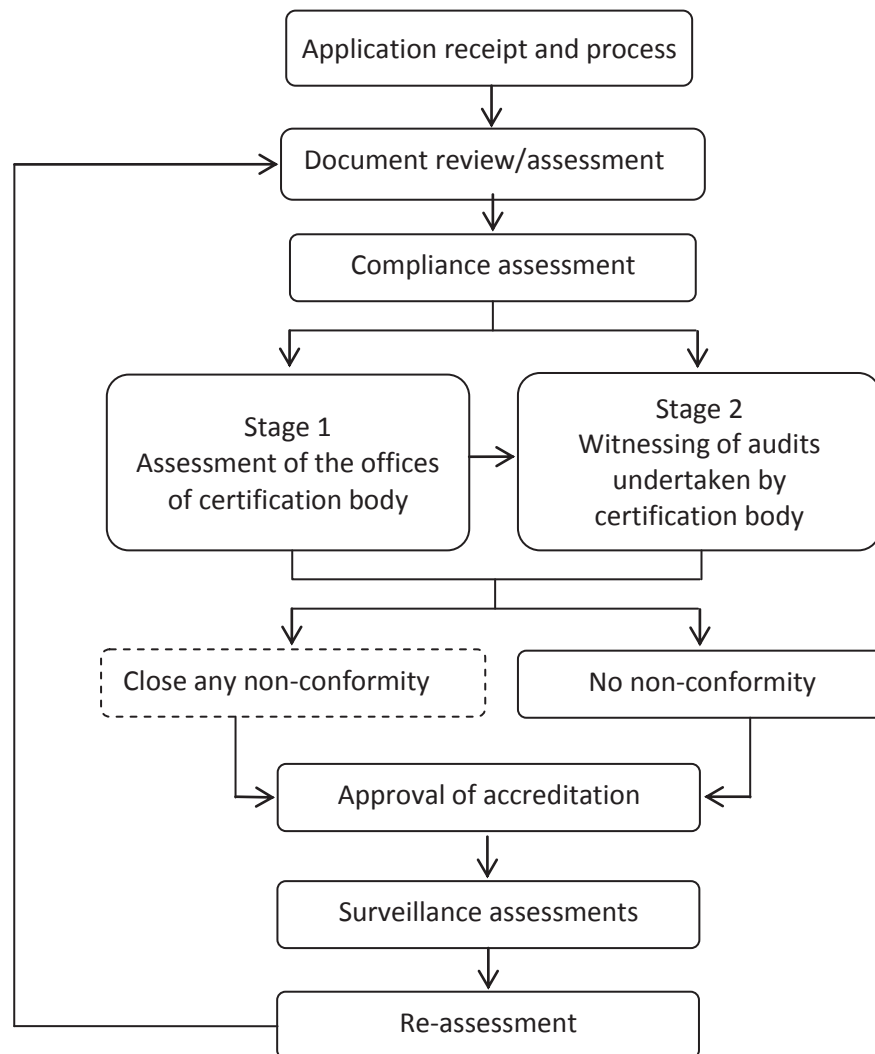
<b>Enforcement measures</b>	<b>ISO 22000</b>	<b>BRC</b>	<b>WQA</b>
<b>Approval of certification body</b>	-	+	+
<b>Accreditation</b>	+	+	-
<b>Audit protocol</b>	+	+	+
<b>Requirements for auditors</b>	+	+	+
<b>Auditor registered by personnel certification bodies</b>	+	-	+
<b>Auditor registered by scheme owners</b>	-	+	-
<b>Surveillance of performance of certification bodies</b>	-	+	+

Note: “+” means that measures are in place, “-” means that measures are not in place.

*Source: Author’s elaboration based on document analysis*

### **7.3.1 Accreditation**

In my survey among certification bodies in New Zealand, five certification bodies claimed that national or international accreditation bodies were important in ensuring that they are independent and objective in practice. Six certification bodies indicated that it was important for them to demonstrate their independence and objectivity to stakeholders through accreditation. Accreditation is a third-party attestation which states that certification bodies or other conformity assessment bodies are competent to carry out certain conformity assessment activities such as certification and inspection (ISO/IEC, 2004). In the process of accreditation, certification bodies are assessed against certain criteria by the assessors of accreditation bodies (Figure 7.4).



**Figure 7.4: Process of accreditation**

*Source: Author's elaboration based on document analysis*

For the BRC Global Standard for Food Safety, certification bodies must obtain accreditation from BRC approved accreditation bodies within 12 months of registration in order to retain registration. In the case of ISO 22000, accreditation is voluntary for certification bodies. In 2007, ISO issued ISO/TS 22003 Food safety management systems -- Requirements for bodies providing audit and certification of food safety management systems, which aimed to build confidence in ISO 22000 certification

through accreditation against it. Woolworths Limited does not require approved certification bodies to be accredited. However, as mentioned by one respondent, the accreditations of certification bodies for other certification schemes are taken into account when Woolworths Limited approves certification bodies.

### **7.3.2 Competition of certification market**

Four respondents of my survey among certification bodies in New Zealand indicated that increasing competition among certification bodies negatively affected the objectivity and neutrality of the audit process. One respondent suggested that “In New Zealand in recent years, the competitive pressure has seen a considerable number of superficial food safety audits, and compromises being made in objectivity and neutrality in order to gain or retain clients.” The other three respondents did not think that increasing competition had a negative impact on the objectivity and neutrality. Two respondents claimed that the accreditation and control measures of other involved stakeholders (e.g. approval) could mitigate the negative influence of increasing competition in the market. One respondent believed that competition could increase the objectivity and neutrality only if greater technical proficiency was demanded by scheme owners or audited food businesses.

As the competition in the audit and certification market is fierce (Anders et al., 2010), it is very difficult for third-party certification bodies to operate as completely independent actors in the global food supply chain. They have to make profits and survive. Hence, they may strive to minimise their audit time to decrease costs (Albersmeier et al., 2009) and may not consider the quality of their audits (Hatanaka & Busch, 2008).

For most non-regulatory FSMS, food enterprises are free to choose the certification body and even can change it at any time. Consequently, certification bodies can become dependent on their clients (food enterprises) for their businesses. They may sign contracts with their clients with a special term or auditing fee, which is known as 'low-balling'. In order to get the contract, certification bodies sharply decrease the fee for the first audit and try to make profits from an on-going relationship, with such things as the annual fee for surveillance or recertification audits. Since the annual audit fee depends on customer loyalty, it is a quasi-rent. Low-ball marketing lets certification bodies become dependent on their clients (Makkawi & Schick, 2003). Hence, certification bodies can lose their supposed objectiveness and independence. Three respondents of my survey among certification bodies indicated that signing a long contract with a food manufacturing enterprise had negative impacts on the audit quality, while another three respondents did not think it had any influence. Notably, one believed that it could improve the audit quality.

If certification bodies have to be approved by scheme owners to perform respective audits or certification services (such as the situation of the BRC and WQA), the number of certification bodies could be controllable in certain regions or nations. Then the level of competition in those areas can be controlled.

### **7.3.3 Competency and integrity of auditors**

Third-party food safety audits are carried out by auditors. Their training, experience, competency and judgement back up the whole range of procedures of the audit (Power, 1997). My survey among certification bodies also investigated the importance of the auditor's technical knowledge and audit skills for a reliable audit outcome.

Three respondents claimed that it was extremely important for a reliable audit outcome for auditors to have a good technical knowledge of the industry or product. Four respondents indicated that the auditor's good audit practice skills were extremely important to a reliable audit outcome. Five respondents claimed that technical knowledge and audit skills were equally important to a reliable outcome for the auditors.

For most non-regulatory FSMS, the requirements of auditors are in place. Table 7.2 summarises the requirements of auditors who conduct audits of ISO 22000, BRC Global Standard for Food Safety and WQA. All these requirements for auditors provide an assurance that auditors have enough of the technical knowledge and audit skills to perform food safety audits.

**Table 7.2: Requirements of auditors who conduct audits of ISO 22000, BRC Global Standard for Food Safety and WQA**

	ISO 22000	BRC	WQA
<b>Registration /certification Education</b>	Personnel certification bodies (RABSQA, in New Zealand)	BRC	RABSQA, qualification-based or competency-based food safety auditor certification scheme
	Post-secondary education, including general microbiology and chemistry, and courses related to the food industry	Degree in a discipline of food-related or bioscience, or higher education courses in a discipline of food-related or bioscience	<i>Competency –based:</i> Tertiary education <i>Qualification –based:</i> A minimum of secondary education
<b>Training</b>	-- Food safety training, including HACCP and food safety management principles -- Audit training, including ISO 19011 Guidelines for auditing management systems and food safety management system standards	-- A registered Management System Lead Assessor Course or BRC Third Party Auditor course -- HACCP course (at least 2 days' duration)	--5 day lead auditors course -- WQA Training Course -- VITAL 2 - Allergen Bureau -- Min. 2 day HACCP with competency assessment -- HACCP refresher every 3 years -- Ongoing training and calibration on 6 monthly cycle Competency –based:
<b>Work Experience</b>	At least 5 years of full-time work experience in the food industry, including a minimum of 2 year of work in quality assurance or food safety management in the food industry	At least 5 years' post-qualification work experience related to the food industry	A minimum of 2 years work experience of food safety management in a technical or managerial position Qualification –based: A minimum of 2 years work experience of food safety management in a technical or managerial position which takes place in the four year before application. Moreover, applicant must have total amount of work experience (4-8 years) based on education level
<b>Auditing experience</b>	A minimum of 12 food safety management system audit days in at least four companies under the leadership of a qualified auditor	A period of supervised training through 10 audits or 15 audit days of third-party food safety audits against ISO 22000, ISO 9000 (at food companies), GFSI approved Standards, including at least 5 audits against BRC Global Standard for Food Safety	<i>Competency –based:</i> Based on different sub-sector of the food industry Qualification –based:20 audit days

*Source: Author's elaboration based on document analysis*

#### 7.3.4 Audit scope

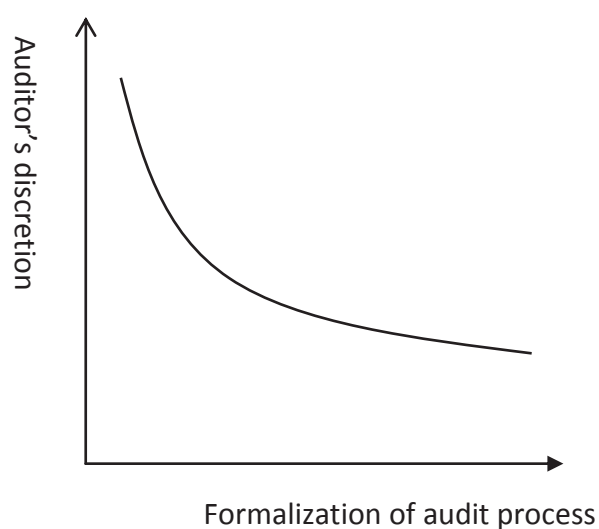
The standards of non-regulatory FSMS *per se* have an impact on the audit quality, as they determine the audit scope. These standards must be scientifically evidence-based (D. A. Powell et al., 2013) and designed to be auditable. As new technologies and issues keep emerging in the food industry and other related fields, these standards must also be reviewed and revised at regular intervals to reflect those latest issues and technologies.

In terms of how effective non-regulatory FSMS are in helping to ensure food safety, most respondents from my survey among certification bodies in New Zealand indicated that the public industry sector schemes were the most effective, followed by the public international standard schemes. Private individual firm schemes were rated as the least effective. Most responding certification bodies had high confidence in the standard setting process found in international agencies and NGOs such as industry associations, while they had low confidence in individual firms e.g. retailers and food businesses. They also indicated that the non-regulatory FSMS will become more stringent over the next 5-10 years.

The audit protocols are outlined in the documents of many non-regulatory FSMS.

There is a section focusing on the audit protocol in the document of the BRC Global Standard for Food Safety. That section sets out the requirements for the whole process in Figure 7.2. In ISO/TS 22003, the detailed requirements for the audit process are also included. According to one respondent of my survey among certification bodies, the requirements for audit processes of some schemes were more detailed and prescribed than those of others. As a result, the audits of these schemes are more formalized. On

one hand, this formalization could increase the consistency and integrity of audits conducted by different auditors or different certification bodies. On the other hand, it could also deemphasize auditors' own discretion (Figure 7.5). This may result in ritualism in an audit, and then the audit quality is undermined. A relative balance between formalization of the audit conduct and the auditor's own discretion should be identified to ensure a desirable level of audit integrity and to empower auditors to make independent and objective judgements.



**Figure 7.5: Function of auditor's discretion and formalization of audit process**

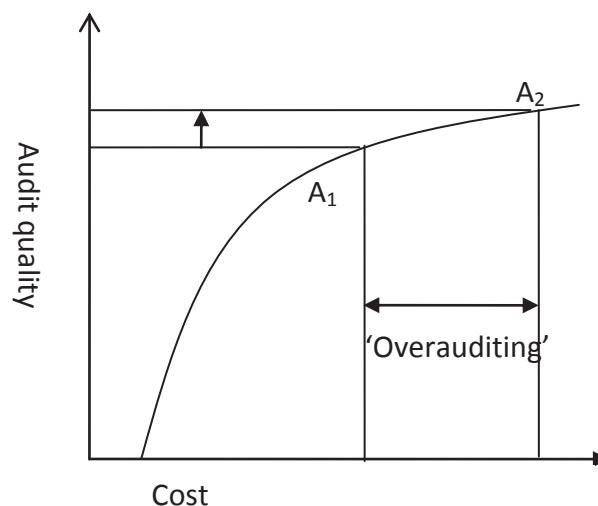
### **7.3.5 Audit time**

All certification bodies responding to the survey indicated that reducing audit costs could undermine the audit quality. Although, an audit is only a snapshot in time, it can identify the strengths and weaknesses of a food safety management system if auditors conduct the audit properly and spend enough time on site (D. A. Powell et al., 2013). In documents of some non-regulatory FSMS, a minimum of audit time on one site is set out. For instance, there is a statement in the document of the BRC Global Standard for



Food Safety that “the typical duration of an audit is two man days at the site” (BRC, 2011, p. 64). A calculator was developed by the BRC to determine the audit time based on the characteristics of the food enterprise (e.g. size, product, and complexity of production lines).

There are no infinite resources available for auditing, and auditors can only spend limited time on one audit. The function of audit quality against audit cost is illustrated in Figure 7.6. The audit quality can only reach a certain level, even with unlimited audit resources. With a shift from  $A_1$  to  $A_2$  along the function in Figure 7.7, the marginal benefit is low, while marginal cost is substantial. At this point, any further increase is regarded as ‘overauditing’ (Power, 1997). Based on the guidance from the scheme owner and the specific situation of the auditee, certification bodies have to optimise the audit time.



**Figure 7.6: Function of audit quality and cost**

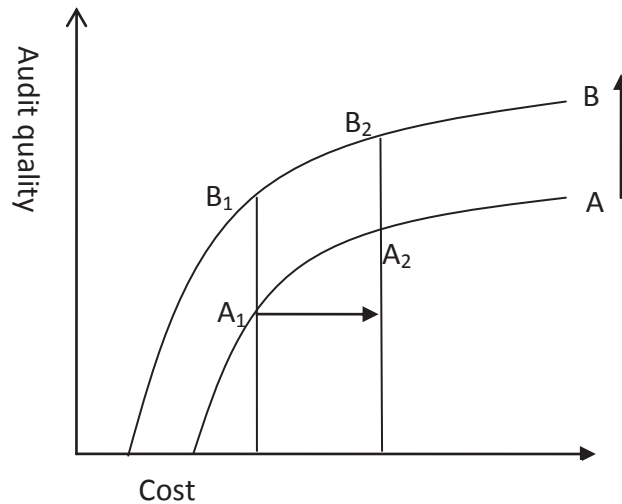
*Source: Adapted from Power*

### **7.3.6 Surveillance activities of scheme owners**

In the case of non-regulatory FSMS which have scheme owners, certification bodies have to be approved by the scheme owners, and are obligated to meet key performance targets and other requirements of competency and capability. The scheme owners usually conduct a series of activities to monitor the performance of approved certification bodies. For example, BRC regularly reviews a certain number of audit reports to assess the conformity of a certification body to the requirements of quality and consistency, assess the head offices of certification bodies, and undertake witness audits. Once certification bodies fail to meet supposed performance requirements, BRC will suspend them or even remove them from the list of approved certification bodies.

### **7.4 Ways to improve the quality of third-party food safety audits**

Based on the analysis of the function of audit quality and cost, there are two approaches to improve the audit quality (Figure 7.7). One is the shift from  $A_1$  to  $A_2$  (or  $B_1$  to  $B_2$ ) along the function in Figure 7.7. The other one is the upward shift from function A to function B. Although the control measures of non-regulatory FSMS discussed in section 7.3 can gain either or both types of shift, there are other new measures which can achieve these shifts as well. In my survey, respondents' opinion on some measures to improve the audit quality was examined.



**Figure 7.7: Approaches to improve audit quality**

*Source: Adapted from Power*

#### **7.4.1 Measures aiming to achieve the shift along the function**

##### **7.4.1.1 Extending the liability of certification bodies**

Four respondents in my survey among certification bodies in New Zealand indicated that the audit quality can be improved by extending the liability of certification bodies, while two respondents thought that it has no impact on the audit quality. If the liability of certification bodies is intensified, the potential liability resulting from audit failures increases. Thus certification bodies are motivated to improve audit quality to avoid any failures. However, the threat of liability is slight in practice. For non-regulatory food safety audits, there is no absolute liability, and then it is borne by the injured party to prove that the audit conducted by a certification body failed. This is difficult for the injured party as an outsider, without intervention from the government.

In my survey, respondents were also asked to indicate whether the government should regulate the third-party auditing activities of non-regulatory food safety management

schemes in New Zealand. Six certification bodies suggested that the government should not regulate these activities, while only one certification body claimed that the government should. Typical reasons given by respondents who thought the government should not be involved were that accreditation has already provided suitable controls over these activities, and that government agencies have little understanding of non-regulatory food safety management schemes due to these schemes being aimed above the regulatory compliance level.

#### **7.4.1.2 Naming and shaming the failed certification bodies by the scheme owner**

Three respondents in my survey among certification bodies claimed that naming and shaming the failed certification bodies by the scheme owner could improve the audit quality. Four respondents did not think that this would influence the quality of the audit. This kind of naming and shaming can intensify the effects on the reputation of certification bodies. They can be driven to improve the audit quality to avoid naming and shaming and to protect their reputation. In this way, food manufacturing enterprises can get more performance information on different certification bodies to help decide which certification body to sign a contract with. Highly reputed certification bodies can have competitive advantages in the market of third-party food safety audits.

#### **7.4.2 Measures aiming to achieve the upward shift from function A to B**

##### **7.4.2.1 Increasing the requirements of auditors**

Four respondents in my survey among certification bodies indicated that increasing the requirements of auditors could improve the quality of an audit. Two certification bodies thought that it could undermine the audit quality. In practice, more competent

and experienced auditors can obtain higher quality of audit with the same audit cost.

As mentioned in 7.4.3, different schemes have different requirements for their auditors. More training, work and audit experience may be required.

#### **7.4.2.2 Adopting the risk oriented auditing practice**

Four respondents in my survey among certification bodies claimed that a certification body can improve the audit quality by adopting a risk oriented auditing practice instead of carrying out the audit schematically. Two respondents did not believe that it had an impact on the audit quality. In contrast to schematic audit practices, the risk oriented approach takes specific characteristics of manufacturing enterprises (e.g. sub-sector, size, targeting markets) into consideration. Auditors can allocate more efforts to high risk fields to audit the client more efficiently and effectively.

### **7.5 Conclusions**

The quality of third-party food safety audits was identified by respondents as an important factor which could impinge on the effectiveness of non-regulatory FSMS. This chapter analyses the role of third-party food safety audits in the implementation of non-regulatory FSMS. Factors influencing audit quality are investigated, and ways to improve audit quality are analysed. The third-party food safety audit works as an independent and objective institution of enforcement to provide assurance of the implementation of non-regulatory FSMS. It offers information about the conformity of food manufacturing enterprises to stakeholders along the food supply chain. Through the involvement of third-party audits, the responsibility of ensuring food safety is shared among stakeholders along the food supply chain. When the third-party food safety audit is used properly as an improvement tool of food safety management, it is

very effective in facilitating continuous improvement in food safety management and could lift up the level of food safety management in food manufacturing businesses. Auditors should be able to provide guidance to senior management of food businesses on gaps and opportunities in their food safety management systems, and then food businesses could work proactively on these gaps and food safety risks to prevent food safety issues and losses.

There are similarities among certification processes of different non-regulatory FSMS. Food manufacturing enterprises have to implement relevant standards, be audited by certification bodies, take corrective actions to close any non-conformity and keep ongoing compliance to relevant requirements. During the period for which the certificate is valid, certification bodies should conduct surveillance activities to assess the ongoing conformity of the food manufacturing enterprises. However, some schemes have their special processes. For instance, Woolworths Limited, the scheme owner of WQA, is much more involved in the certification process. Food manufacturing enterprises can only be invited into the WQA programme by Woolworths Limited. Certification bodies are also nominated by Woolworths Limited. In addition, certification decisions are made by Woolworths Limited.

Factors, which can have impact on the quality of third-party food safety audits, includes accreditation, competition in the certification market, competency and integrity of auditors, audit scope, audit time, and surveillance activities of scheme owners. As indicated by certification bodies responding to my survey, accreditation is important to ensure the independence and objectivity of certification bodies, and is an important way to demonstrate that they are independent and objective. Increasing

competition among certification bodies could negatively affect the objectivity and neutrality of the audit process, and compromise the audit quality. If certification bodies have to be approved by scheme owners to perform respective audits or certification services (such as the situation of the BRC and WQA), the number of certification bodies could be controllable in certain regions or nations. Then the level of competition in those areas can be controlled. Technical knowledge and audit skills of auditors are vital to the audit quality. The standards of non-regulatory FSMS *per se* have impacts on the audit quality, as they determine the audit scope. A relative balance between the formalization of the audit conduct and the auditor's own discretion should be identified to ensure a desirable level of audit integrity and to empower auditors to make independent and objective judgements. All certification bodies responding to my survey indicated that reducing audit time could undermine the audit quality. Based on the guidance from the scheme owner and the specific situation of the auditee, certification bodies have to optimise the audit time. The scheme owners could conduct a series of activities to monitor the performance of approved certification bodies to ensure that these certification bodies meet key performance targets and other requirements of competency and capability.

Besides the existing controlling measures of non-regulatory FSMS, the quality of third-party food safety audits can be improved in four ways. The audit quality can be improved by extending the liability of certification bodies. Naming and shaming the failed certification bodies by the scheme owner could improve the audit quality. Increasing the requirements of auditors could positively affect the quality of an audit. Finally, a certification body can improve the audit quality by adopting a risk oriented auditing practice instead of carrying out the audit schematically.

## **CHAPTER 8 FOOD SAFETY CULTURE IN THE FOOD MANUFACTURING INDUSTRY IN NEW ZEALAND**

### **8.1 Introduction**

Food safety is an issue of both food science and behavioural science (Yiannas, 2009). Foodborne illness outbreaks result from not only issues relating to the infrastructure of a food business but also from the behaviours of managers and employees. The effectiveness of food safety management systems (FSMS) such as Hazard Analysis and Critical Control Point (HACCP) can be influenced by the belief, commitment and behaviour of both managers and workers (Ball et al., 2009; Mensah & Julien, 2011; Wilcock et al., 2011). The belief, commitment and behaviour of all employees are affected by organisational culture in a food business. Food safety should be an integral part of the organisational culture of a food business, to effectively execute food safety management. In other words, those involved in the food business need to care about the safety of their products. This goes beyond following government rules and regulations. As identified in Chapter 4, food safety culture is vital to ensure that non-regulatory FSMS are effectively implemented.

The concept of food safety culture has attracted a large amount of attention from researchers and stakeholders along the food supply chain. In a food business, food safety culture is a component of the organisational culture. It is the way in which a food business and its employees deal with and value food safety. Ideally, employees and management need to take personal responsibility for food safety. The food safety culture can fundamentally impact day-to-day decisions, behaviours and practices that help to effectively implement a food safety management system (Seward et al., 2012).



It has been found that there were links between failures in food safety culture and foodborne illness outbreaks (Douglas A. Powell et al., 2011). Food safety culture should be taken into consideration as a risk factor when a foodborne outbreak takes place (Griffith et al., 2010b). An independent review, issued by the Canadian government, revealed that the weak food safety culture in XF Foods Inc. led to the massive beef recall in Canada and the US in 2012 (Lewis et al., 2013). The independent investigation panel found that both plant staff and Canadian Food Inspection Agency (CFIA) officials on site did not always meet their responsibilities towards food safety regulations.

Food safety culture can be strong or weak; however, it always exists in a food business no matter how large or small it is. Understanding the food safety culture in a food business is important as it could markedly affect the continuous improvement and changes in food safety management. Creating or improving a food safety culture requires applying the principles and knowledge of both food science and management science (Douglas A. Powell et al., 2011). Few studies have been designed to investigate the food safety culture in the food manufacturing sector, especially in New Zealand. In order to examine the food safety culture in the food manufacturing industry of New Zealand, respondents to the survey of food manufacturing enterprises were asked to indicate their degree of agreement to eighteen statements relating to food safety culture based on their perception of the situation in their companies. Those statements covered four dimensions of food safety culture: dominant characteristics, organisational leadership, sharing of knowledge and information, and employee involvement.

In this chapter, the concept of food safety culture is first defined and analysed from different levels and dimensions. Section 8.3 investigates the food safety culture in the food manufacturing industry in New Zealand. The impacts of enterprise characteristics (non-regulatory FSMS in place or not, sub-sector, size, and exporting status) on food safety culture are examined in section 8.4.

## **8.2 Food safety culture**

### **8.2.1 Three levels of food safety culture**

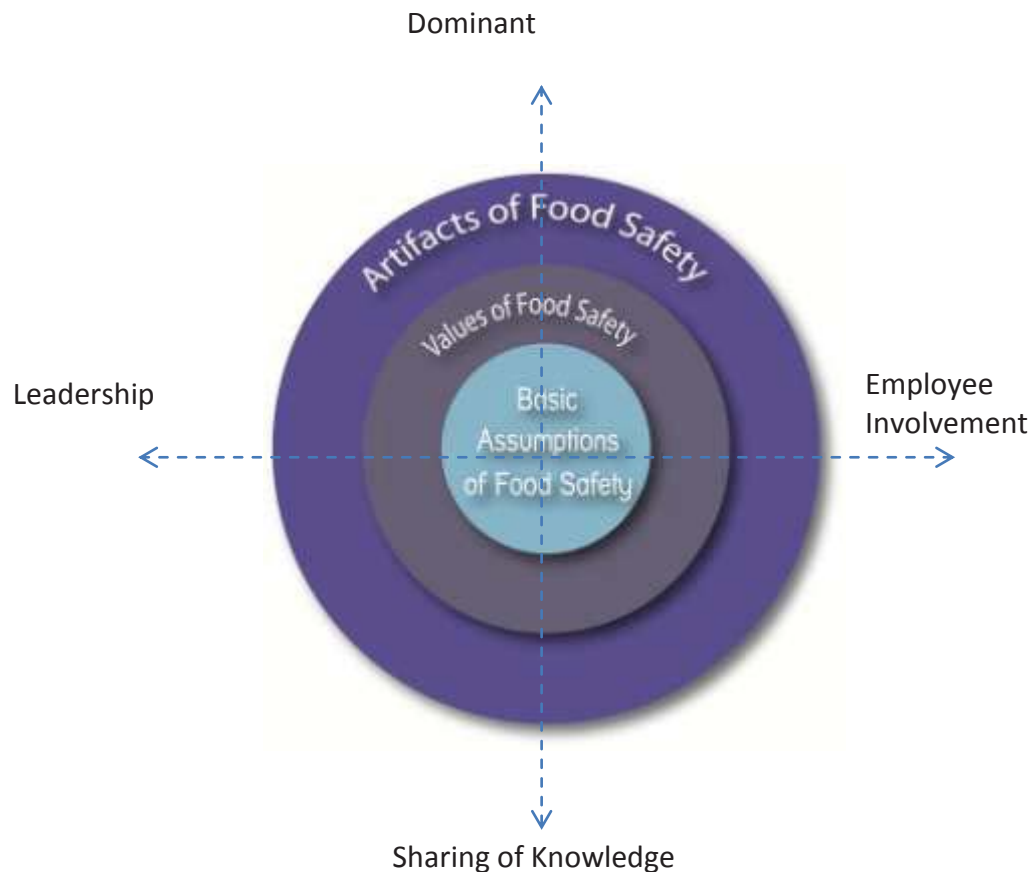
An organisational culture is composed of “the deep, basic assumptions and beliefs, as well as the shared values, that define organisational memberships, as well as the members’ habitual ways of making decisions, and presenting themselves and their organisation to those who come into contact with it” (Clegg, Kornberger, & Pitsis, 2008, p. 224). There are three different levels of culture in an organisation, including artifacts, espoused beliefs and values, and basic underlying assumptions (Schein, 2010). As a food safety culture is just part of the whole organisational culture, it can also be differentiated among three levels (Figure 8.1).

The first level involves the artifacts of food safety, which include visible organisational features, such as the architecture of the factory, business card, website, uniforms and observable rituals. These artifacts can reveal how food safety is portrayed in a food business. These features can be easily identified and observed, but are difficult to decipher.

The second level refers to espoused values of food safety. They are non-visible aspects of the food safety culture, which include the norm of and belief in food safety that employees express when they discuss food safety and other related organisational

issues. Food safety should be clearly defined as one of the values of a food business, rather than just a priority (Yiannas, 2009). Priorities can vary according to business circumstances, however, values should not. Values guide how the decisions are made and business is conducted. A commitment to food safety is also part of this level. It is extremely important to document this commitment, because a written one is much more effective than an oral one. It provides assurance for the consistence between the behaviours of the organisation or employees and its beliefs (Jiang, 2007; Yiannas, 2009).

The third level, the deepest, represents the basic assumptions of food safety, which are hidden under artifacts and exposed values. This level is the most important and is located in the heart of the dartboard of the food safety culture. These basic assumptions subconsciously create the artifacts and values of an organisation, and implicitly guide organisational members' behaviours (Schein, 2010). For example, it is a moral obligation for a food business to ensure the safety of the food it supplies.



**Figure 8.1: Food safety culture**

### **8.2.2 Components of food safety culture**

The three-level analysis of food safety culture is useful to fully understand the concept of food safety culture, however, it is still not able to clearly assess or measure the food safety culture in a food business. The key to assessing the food safety culture is to identify aspects of a food business that reflect those three levels. The individuals in a food business can respond to these aspects based on their own experience. Therefore, food safety culture should also be regarded as a multi-dimensional concept (Cameron & Quinn, 2011). It can be analysed from four dimensions: dominant characteristics, organisational leadership, sharing of knowledge and information, and employee

involvement (Figure 8.1). Each of the four dimensions covers aspects of food safety culture in each of the three different levels.

#### **8.2.2.1 Dominant characteristics**

Food safety should be a foundational value of a food business. It is not only a legal obligation but also a moral one to ensure food safety and to prevent foodborne illness. All employees should be confident in eating or recommending the products they produce.

Trust is built among all staff in terms of food safety management. The food safety assurance team should build close and cooperative relationships with floor workers (Lutchman, Maharaj, & Ghanem, 2012). They should work in concert with each other to ensure that FSMS are effectively implemented. Employees are encouraged to tell their co-workers when they are doing something that could cause a food safety issue.

Decisions, behaviours and operational practice do not change when internal or external audits are carried out. Auditors are not regarded as watchdogs or policemen; rather, they are there to support food safety management and to identify gaps and opportunities in the food safety management system of a food business (Lutchman et al., 2012).

#### **8.2.2.2 Leadership**

Food safety should be a very high priority for leadership. As identified in Chapter 4, the most important factor influencing the effectiveness of non-regulatory FSMS was top management commitment to food safety. This is in agreement with the finding of Mensah and Julien (2011) which showed top management commitment was the most highly ranked successful implementation factor of the food safety management system

in the UK. Top management commitment can ensure acceptance and enough support such as financial investment to implement a food safety management scheme (Ball et al., 2010).

It is crucial that employees see that senior management staff or managers have the right attitudes and enact their behaviours that support food safety. How employees perceive senior management attitudes and behaviours in relation to food safety forms the basis for the food safety attitudes and behaviours of employees (Abidin et al., 2013). Negative perceptions of top management's commitment to food safety could compromise employees' commitment and practices in regard to food safety. The leaders should walk the walk and not just talk the talk to demonstrate their commitment to food safety. Managers should always put food safety ahead of production. Top management staff should also be involved in management reviews of the food safety management system.

The responsibilities of employees in different ranks to ensure food safety must be clearly defined (Covey, McChesney, & Huling, 2012). Key performance indicators (KPI) relating to food safety are also formulated in advance. These KPIs should be specific, measurable, achievable, realistic, traceable and time bound (SMART) (Lutchman et al., 2012). There should be one-to-one correspondence between each employee's responsibility and his/her expected performance. He/she is not just an onlooker of food safety management, but a real participant who should take 100% responsibility for the result he/she provides via his/her actions.

### **8.2.2.3 Sharing of knowledge and information**

The sharing of knowledge and information on food safety is central to the food safety management in any food business. Good communication of food safety within a food business is an important indicator of food safety culture (Yiannas, 2009). Knowledge and information on food safety is shared and communicated throughout the whole enterprise via a variety of messages and media. Different approaches are applied to share knowledge and information, including informal, semi-formal and formal (Lutchman et al., 2012). The responsibilities of employees in different ranks to ensure food safety and KPIs in relation with food safety management are effectively communicated throughout the whole enterprise. Employees fully understand how food safety performance is measured.

Food safety training is an important aspect of the sharing of knowledge and information. New employees will be trained on food safety before starting to work (CJ Griffith, KM Livesey, & D. Clayton, 2010a). After training, all employees should really understand the ways in which food can be contaminated. During the food safety training, the ramifications of poor food safety management should be included to demonstrate its adverse impacts on business performance, production efficiency and production costs (Wallace, Powell, & Holyoak, 2005). The training should be combined with field trips to show each worker the importance of every procedure, and enable employees to fully understand their own impact on the overall performance of food safety management. It should cover all levels of staff in the whole enterprise, directors, managers, floor workers, and office staff. In this way, they learn the same food safety control knowledge, and tell the same food safety stories.

#### **8.2.2.4 Employee involvement**

Food safety is not only the job of food safety assurance team, but also is the job of all employees. Ownership and buy-in by all employees are critical for a food business to ensure food safety (Lutchman et al., 2012). Employees should be empowered in regard to food safety management. In order to achieve an employee's KPIs, the needed tools, education and training should be provided to them. They should always follow food safety management practices and procedures, and not change their behaviour and operational practices when internal or external audits happen.

Employees are able to understand what their roles are when a food safety issue occurs. They should be involved in finding the solution to any food safety issues. In this way, they are likely to buy into these solutions and to execute proposed measures effectively. Employees are encouraged or even rewarded for suggestions that will improve food safety. Their contribution to assuring food safety is recognized and rewarded.

The documents of food safety management systems are regularly reviewed with employees (Seward et al., 2012). Being included in the development and review of documents related to food safety management systems could give them a feeling that they are important to food safety management and to the business. Their ownership of food safety management is also strengthened.

### **8.3 Food safety culture in food manufacturing enterprises in New Zealand**

Respondents to the survey among food manufacturing enterprises were asked to indicate their degree of agreement to eighteen statements about food safety culture based on their perception of the situation in their companies. Those statements



covered four dimensions of food safety culture: dominant characteristics, organisational leadership, sharing of knowledge and information, and employee involvement (see Appendix B for details).

#### **8.3.1 Dominant characteristics**

Around 99% of respondents agreed that it was a moral obligation to ensure food safety and prevent foodborne illness, and that all employees in their companies were confident in eating or recommending the products of their enterprise (Table 8.1).

About 90% of respondents thought that food safety was a foundational value of their enterprises; however, another 10% of respondents disagreed with it. Only 8.8% of respondents disagreed that employees were encouraged to tell their co-workers when they are doing something that could cause a food safety issue. Notably, more than 30% of respondents indicated that decisions, behaviours and operational practice changed when internal or external audits were carried out, and less than 20% of respondents strongly agreed with it.

#### **8.3.2 Leadership**

More than 96% of respondents believed that food safety was a very high priority for leadership in their enterprises, while only 2.6% of respondents disagreed with it (Table 8.2). Top management were involved in management reviews of FSMS in around 90% of respondents' enterprises. Around 84% of respondents indicated that food safety was always put ahead of production by managers. More than 15% respondents suggested that managers did not always prioritise food safety during production in their companies. The responsibilities of employees in different ranks to ensure food safety were clearly defined in companies of about 90% of respondents. Around 86% of

respondents agreed that the leaders walked their talk to demonstrate their commitment to food safety, while 12.3% of respondents disagreed with it.

**Table 8.1: Responses to statements of dominant characteristics of food safety culture**

<b>Statements</b>	<b>% rate 1</b>	<b>% rate 2</b>	<b>% rate 3</b>	<b>% rate 4</b>	<b>% rate 0</b>	<b>Mean</b>
<b>Food safety is a foundational value of the company</b>	61.4	28.9	9.6	0.0	0.0	1.48
<b>It is a moral obligation to ensure food safety and preventing foodborne illness</b>	84.2	14.9	0.9	0.0	0.0	1.17
<b>Employees are encouraged to tell their co-workers when they are doing something that could cause a food safety issue</b>	39.5	50.9	8.8	0.0	0.9	1.69
<b>Decisions, behaviours and operational practice do not change when internal or external audits are carried out</b>	19.3	48.2	27.2	4.4	0.9	2.17
<b>All employees are confident in eating or recommending the products of your company</b>	70.2	28.9	0.0	0.0	0.9	1.29

Note: 1 – strongly agree, 2 – agree, 3 – disagree, 4 – strongly disagree, 0 – don't know

**Table 8.2: Responses to statements of leadership of food safety culture**

<b>Statements</b>	<b>% rate 1</b>	<b>% rate 2</b>	<b>% rate 3</b>	<b>% rate 4</b>	<b>% rate 0</b>	<b>Mean</b>
<b>Food safety is a very high priority for leadership</b>	62.3	34.2	2.6	0.0	0.9	1.40
<b>Top management are involved in management reviews of the food safety management system</b>	52.6	36.8	7.0	1.8	1.8	1.57
<b>The leaders walk the talk to demonstrate their commitment to food safety</b>	48.2	37.7	12.3	0.0	1.8	1.63
<b>Managers always put food safety ahead of production</b>	43.9	40.4	14.9	0.9	0.0	1.73
<b>The responsibilities of employees in different ranks to ensure food safety are clearly defined and communicated</b>	26.3	63.2	9.6	0.0	0.9	1.83

Note: 1 – strongly agree, 2 – agree, 3 – disagree, 4 – strongly disagree, 0 – don't know

### **8.3.3 Sharing of knowledge and information**

New employees were trained in food safety before starting to work in around 89% of responding food manufacturing companies (Table 8.3). However, less than 75% of respondents indicated that all employees really understood the ways in which food can be contaminated in their companies. Although around 90% of respondents believed that the responsibilities of employees in a different rank to ensure food safety were clearly defined and communicated, less than 74% of respondents indicated that employees fully understood how their companies measured food safety performance.

### **8.3.4 Employee involvement**

The documents of food safety management systems were regularly reviewed with employees in only 72% of responding food manufacturing companies (Table 8.4). Employees' contribution to assuring food safety was recognized in less than 82% of responding enterprises. About 80% of respondents suggested that employees were encouraged or even rewarded for suggestions that could improve food safety in their companies. Approximately 24% of respondents indicated that employees did not always follow food safety management practices and procedures in their companies. Employees did not change their decisions or practices when there were internal or external audits in only 67.5% of responding food manufacturing companies.

**Table 8.3: Responses to statements of sharing of knowledge and information on food safety**

<b>Statements</b>	<b>% rate 1</b>	<b>% rate 2</b>	<b>% rate 3</b>	<b>% rate 4</b>	<b>% rate 0</b>	<b>Mean</b>
<b>New employees will be trained on food safety before starting to work</b>	43.9	44.7	10.5	0.9	0.0	1.68
<b>All employees really understand the ways in which food can be contaminated</b>	22.8	51.8	24.6	0.9	0.0	2.29
<b>Employees fully understand how your company measures food safety performance</b>	17.5	56.1	23.7	0.9	1.8	2.08
<b>The responsibilities of employees in different ranks to ensure food safety are clearly defined and communicated</b>	26.3	63.2	9.6	0.0	0.9	1.83
<b>Knowledge and information on food safety is shared and communicated throughout the whole company via a variety of messages and media</b>	21.9	62.3	14.9	0.0	0.9	1.93

Note: 1 – strongly agree, 2 – agree, 3 – disagree, 4 – strongly disagree, 0 – don't know

**Table 8.4: Responses to statements of employee involvement in food safety management**

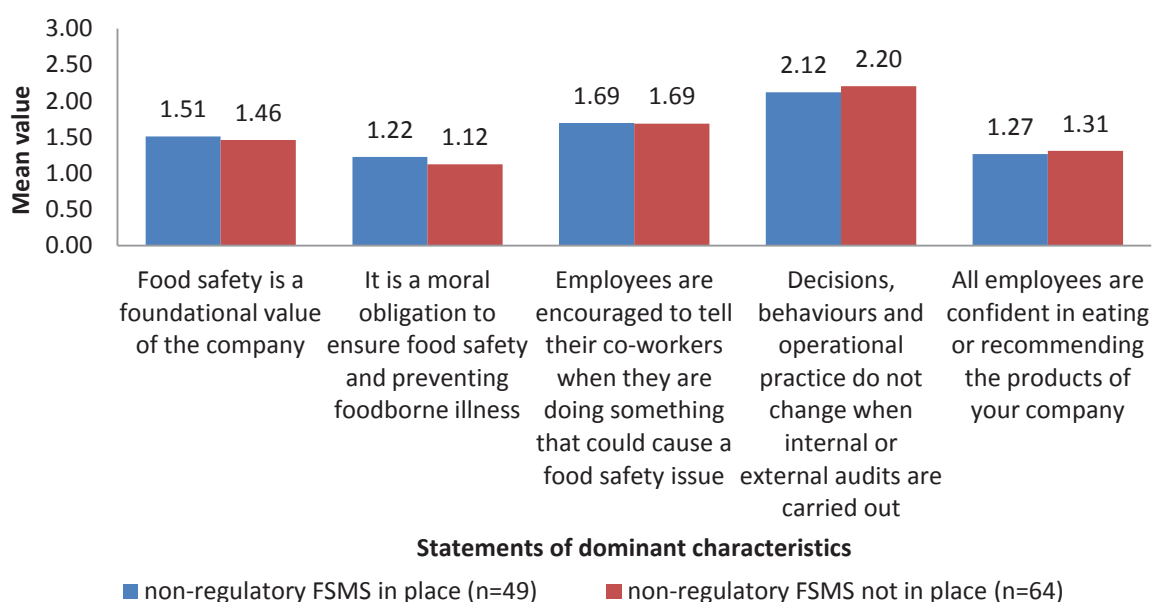
<b>Statements</b>	<b>% rate 1</b>	<b>% rate 2</b>	<b>% rate 3</b>	<b>% rate 4</b>	<b>% rate 0</b>	<b>Mean</b>
<b>Employees always follow food safety management practices and procedures</b>	19.3	57.0	22.8	0.9	0.0	2.05
<b>The documents of food safety management systems are regularly reviewed with employees</b>	16.7	55.3	26.3	0.9	0.9	2.12
<b>Employees are encouraged or even rewarded for suggestions that will improve food safety</b>	20.2	59.6	18.4	1.8	0.0	2.02
<b>Decisions, behaviours and operational practice do not change when internal or external audits are carried out</b>	19.3	48.2	27.2	4.4	0.9	2.17
<b>Employees' contribution to assuring food safety is recognized</b>	16.7	64.9	16.7	0.9	0.9	2.02

Note: 1 – strongly agree, 2 – agree, 3 – disagree, 4 – strongly disagree, 0 – don't know

## 8.4 Impact of enterprise characteristics

### 8.4.1 Influence of non-regulatory FSMS

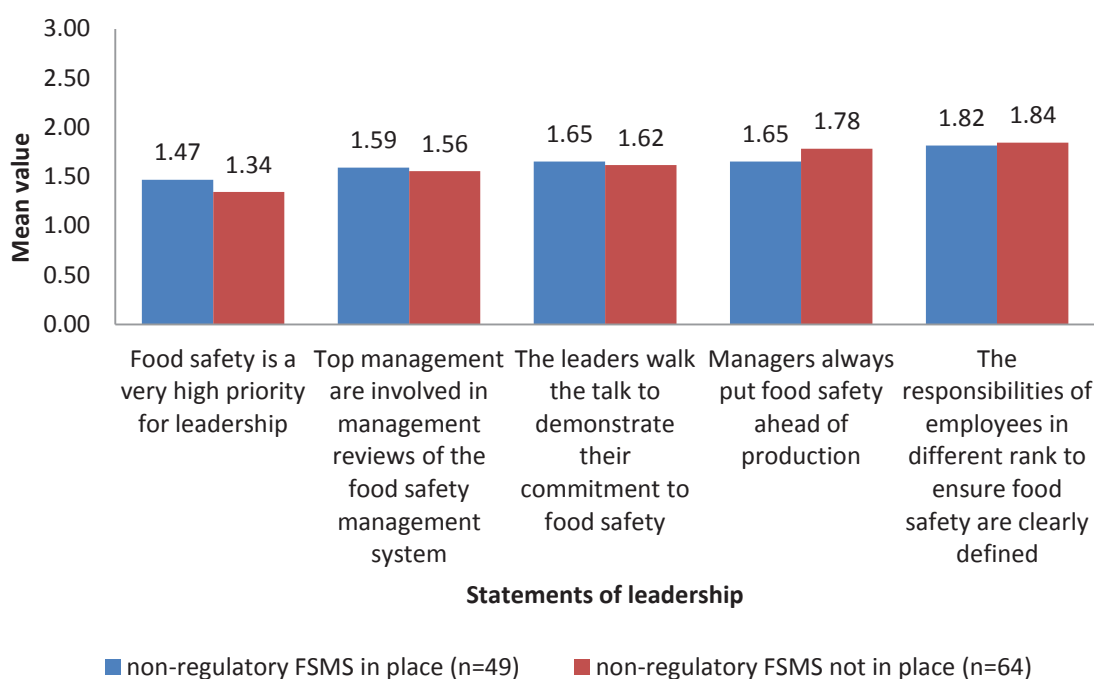
As illustrated in Figure 8.2, the implementation of non-regulatory FSMS had little impact on the mean values for statements relating to the dominant characteristics of food safety culture. In terms of its influence on responses to statements of leadership, respondents having non-regulatory FSMS in place were less likely to strongly agree that food safety is a very high priority for leadership than those without non-regulatory FSMS, however, they were more likely to agree that managers always put food safety ahead of production than those without non-regulatory FSMS (Figure 8.3). During the interview of food safety assurance managers, one of them did mention that audits of non-regulatory FSMS could help them persuade senior management to invest more in food safety management to close any non-compliance identified by external auditors.



**Figure 8.2: Associations between mean values for statements of dominant characteristics and the implementation of non-regulatory FSMS**

Note: 1 – strongly agree, 2 – agree, 3 – disagree, 4 – strongly disagree, 0 – don't know





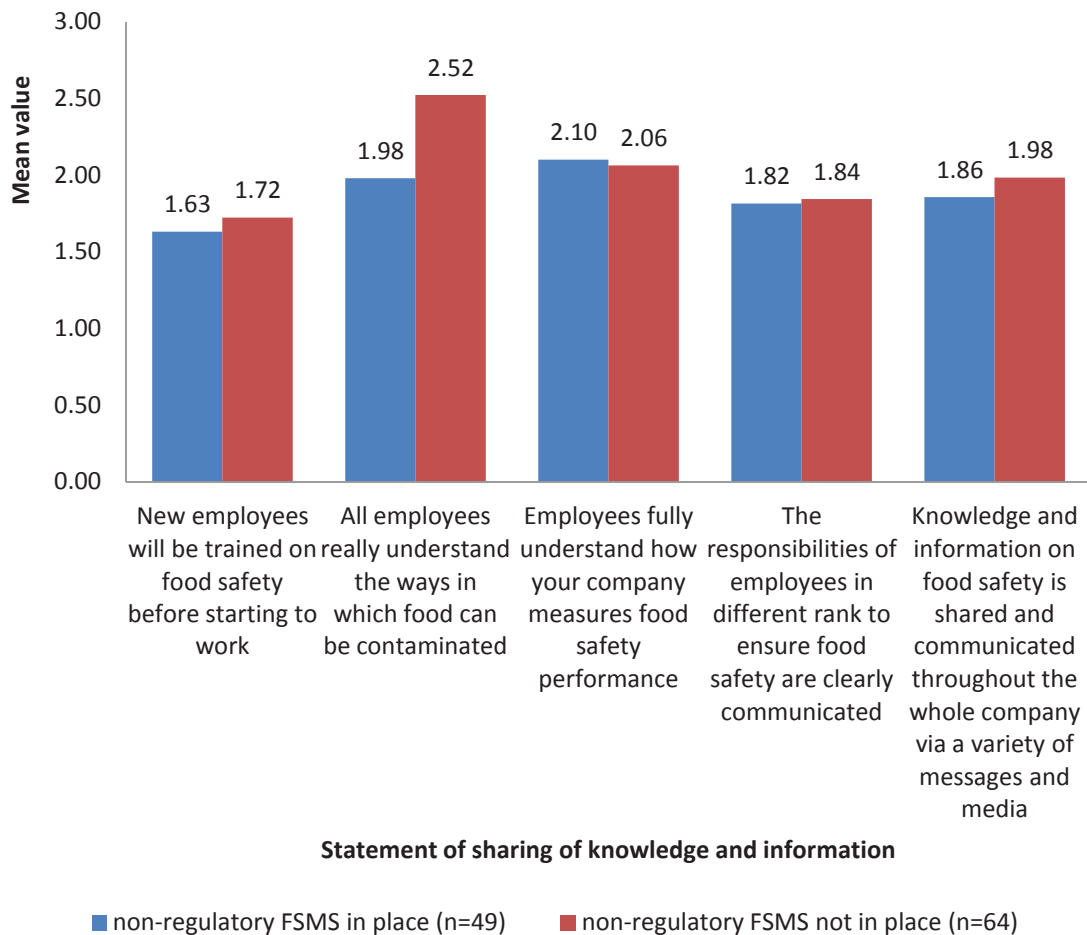
**Figure 8.3: Associations between mean values for statements of leadership and the implementation of non-regulatory FSMS**

Note: 1 – strongly agree, 2 – agree, 3 – disagree, 4 – strongly disagree, 0 – don't know

The implementation of non-regulatory FSMS strengthened the sharing of knowledge and information on food safety. New employees were more likely to be trained in food safety before starting to work in responding enterprises which had non-regulatory FSMS in place than those without non-regulatory FSMS (Figure 8.4). Respondents having non-regulatory FSMS in place were more inclined to agree that employees really understood how food could be contaminated in their companies than those without non-regulatory FSMS. Respondents having non-regulatory FSMS in place had a high level of confidence in the statement that knowledge and information on food safety was shared and communicated throughout the whole enterprise via a variety of messages and media. The level of employee involvement in food safety management was higher in responding enterprises which had non-regulatory FSMS in place than

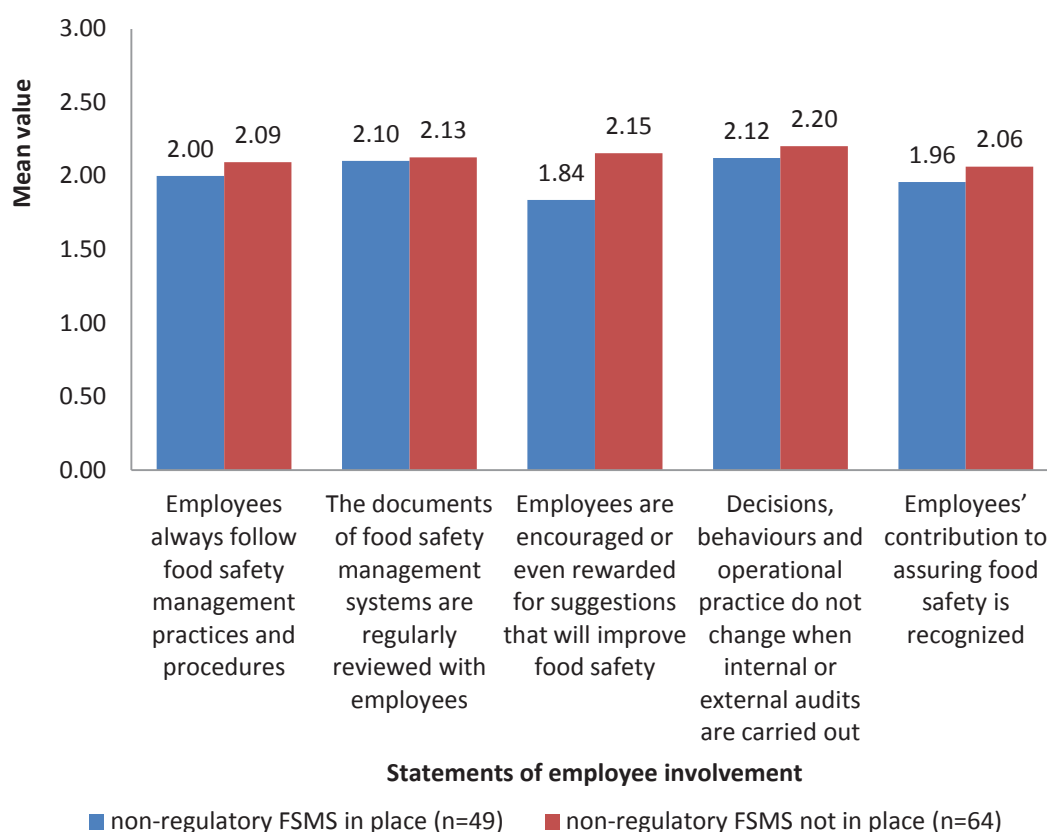
those without non-regulatory FSMS (Figure 8.5). Respondents having non-regulatory FSMS in place were more likely to agree that employees always followed food safety management practices and procedures in their companies than those without non-regulatory FSMS. Compared to responding enterprises without non-regulatory FSMS, employees were more likely to be encouraged or even rewarded for suggestions that could improve food safety and their contribution to food safety management was more inclined to be recognised in those enterprises with non-regulatory FSMS in place. These findings confirmed one of the research findings in Chapter 4 that the food safety awareness of employees increased as a consequence of the implementation of non-regulatory FSMS.

The results from Cross-Tabulation analysis revealed several statistically significant associations between the implementation of non-regulatory FSMS and responses to statements about food safety culture. The association between the implementation of non-regulatory FSMS and responses to the statement that employees always follow food safety management practices and procedures was significant ( $p < 0.10$ ), however the strength of this relationship was relatively weak ( $G = -0.114$ ) (Healey, 2012). The relationship between the implementation of non-regulatory FSMS and responses to the statement that employees are encouraged or even rewarded for suggestions that will improve food safety was significant ( $p < 0.10$ ), and the strength of this association was moderate ( $G = -0.404$ ). The association between the implementation of non-regulatory FSMS and responses to the statement that employees' contribution to assuring food safety is recognized was significant ( $p < 0.05$ ), but the strength of this relationship was relatively weak ( $G = -0.144$ ). All three of these statements belong to the dimension of employee involvement in food safety culture.



**Figure 8.4: Associations between mean values for statements of sharing of knowledge and information and the implementation of non-regulatory FSMS**

Note: 1 – strongly agree, 2 – agree, 3 – disagree, 4 – strongly disagree, 0 – don't know



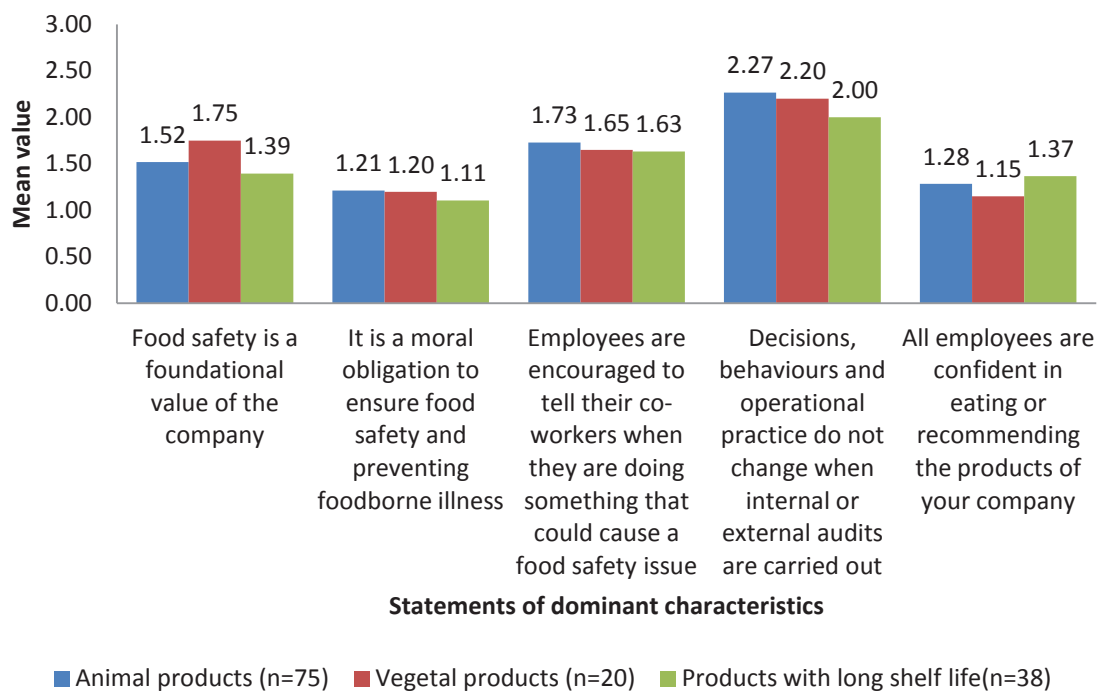
**Figure 8.5: Associations between mean values for statements of employee involvement and the implementation of non-regulatory FSMS**

Note: 1 – strongly agree, 2 – agree, 3 – disagree, 4 – strongly disagree, 0 – don't know

#### 8.4.2 Influence of sub-sector

The sub-sector had substantial impact on responses to statements of the dominant characteristics of food safety culture (Figure 8.6). Respondents in the sub-sector of “products with a long shelf life at an ambient temperature” were the least likely to agree that all employees were confident in eating or recommending the products of their companies, and they were the most likely to agree with the other four statements of dominant characteristics of food safety culture. Respondents in the sub-sector of “vegetal products” were the least likely to agree that food safety was a

foundational value of their enterprise. Respondents in the sub-sector of “animal products” were the least likely to agree that employees were encouraged to tell their co-workers when they were doing something that could cause a food safety issue, and that decisions, behaviours and operational practice did not change when internal or external audits are carried out in their companies.

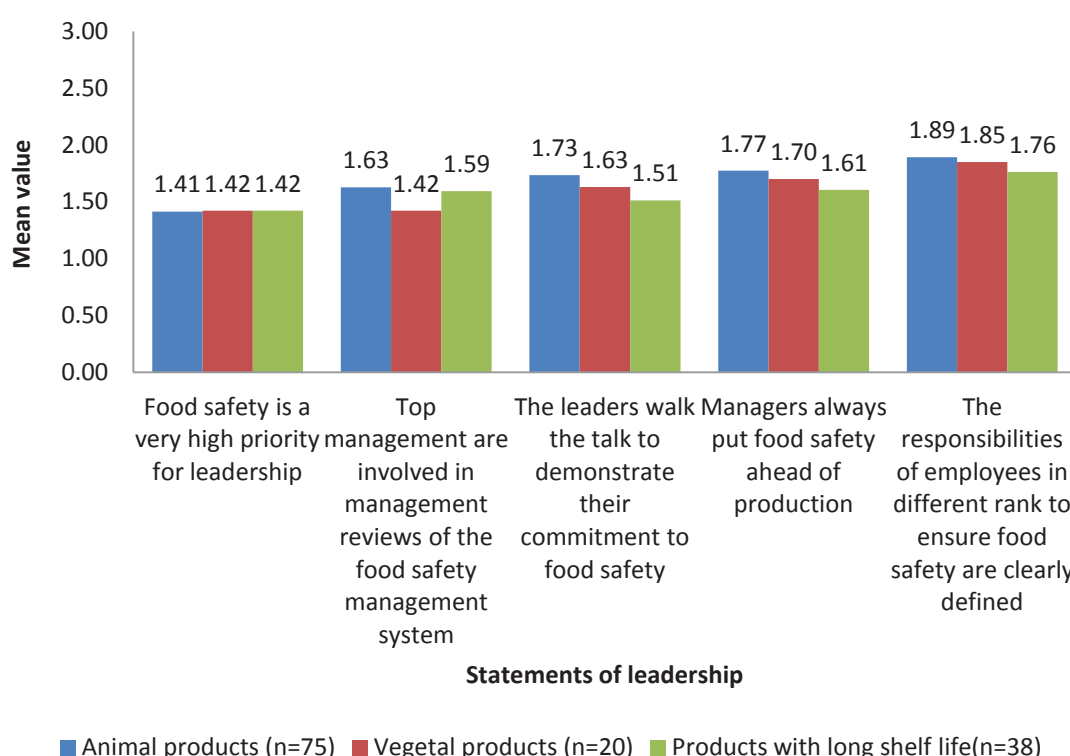


**Figure 8.6: Associations between mean values for statements of dominant characteristics and the sub-sector**

Note: 1 – strongly agree, 2 – agree, 3 – disagree, 4 – strongly disagree, 0 – don’t know

The sub-sector had little impact on responses to the statement that food safety is a very high priority for leadership; however, it had notable impact on responses to the other four statements of leadership of food safety culture (Figure 8.7). For the other four statements, respondents in the sub-sector of “animal products” were the least likely to agree with them. Respondents in the sub-sector of “vegetal products” were the most likely to agree that top management were involved in management reviews

of FSMS in their companies. Respondents in the sub-sector of “products with a long shelf life at ambient temperature” were the most likely to agree that the leaders walked the talk to demonstrate their commitment to food safety and always put food safety ahead of production, and that the responsibilities to ensure food safety are clearly defined for each related department and employee.



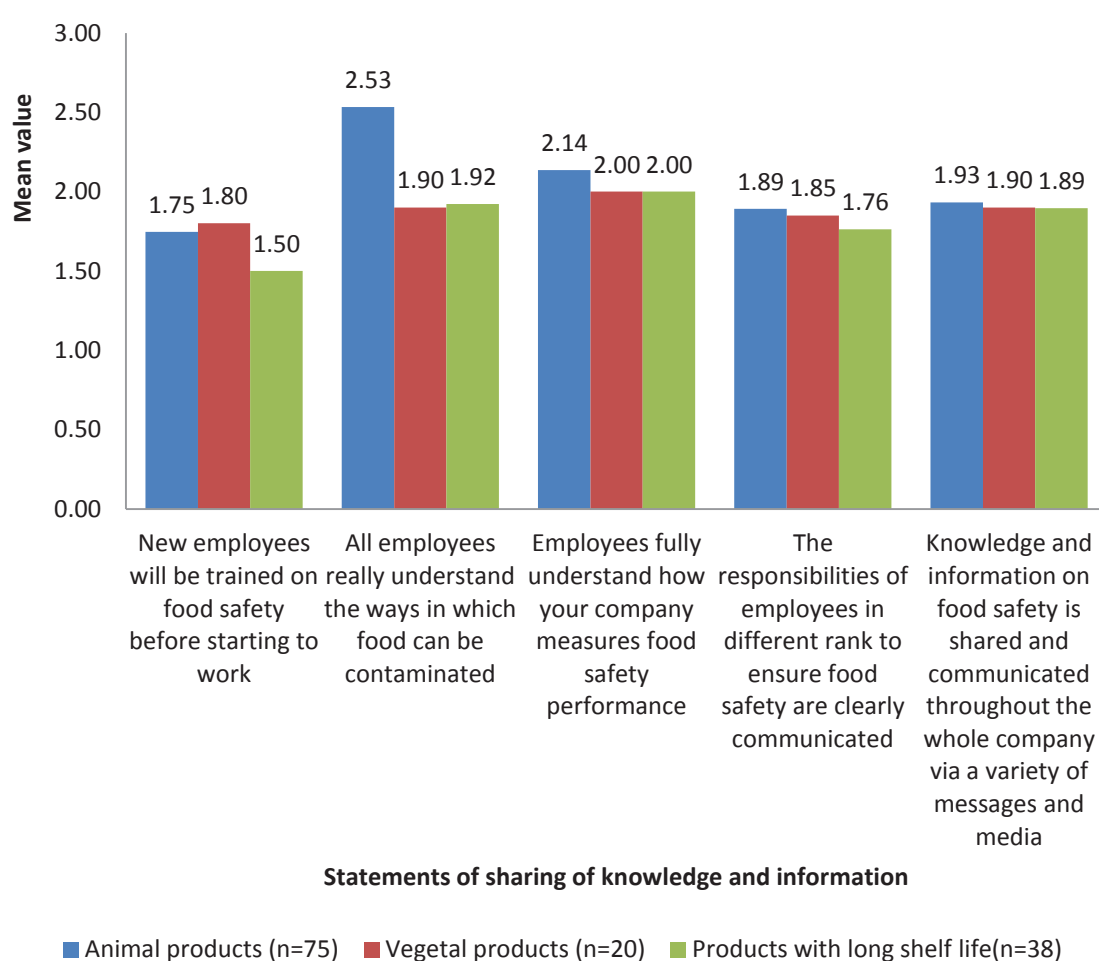
**Figure 8.7: Associations between mean values for statements of leadership and the sub-sector**

Note: 1 – strongly agree, 2 – agree, 3 – disagree, 4 – strongly disagree, 0 – don’t know

Respondents in the sub-sector of “products with a long shelf life at an ambient temperature” were the most likely to agree with all five statements of sharing of knowledge and information on food safety (Figure 8.8). Respondents in the sub-sector of “vegetal products” were the least likely to agree that new employees were trained

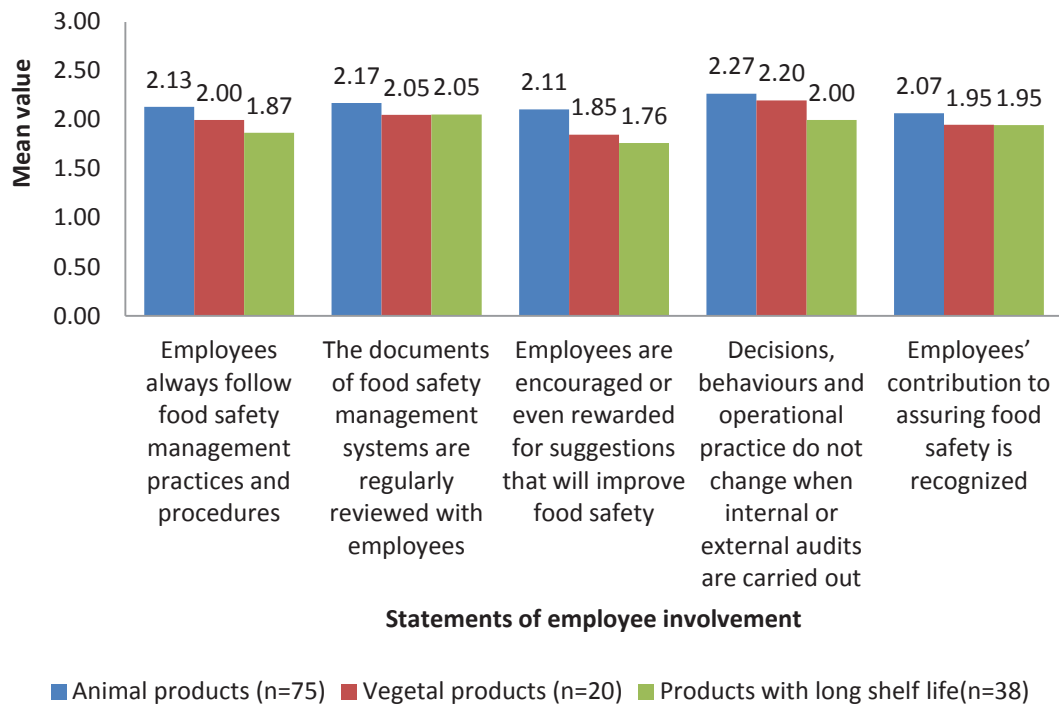
in food safety before starting to work. For the other four statements, respondents in the sub-sector of “animal products” were the least likely to agree with them.

For all five statements of employee involvement in food safety management, respondents in the sub-sector of “products with a long shelf life at ambient temperature” were the most likely to agree with them, while respondents in the sub-sector of “animal products” were the least likely to agree with them (Figure 8.9).



**Figure 8.8: Associations between mean values for statements of sharing of knowledge and information and the sub-sector**

Note: 1 – strongly agree, 2 – agree, 3 – disagree, 4 – strongly disagree, 0 – don’t know



**Figure 8.9: Associations between mean values for statements of employee involvement and the sub-sector**

Note: 1 – strongly agree, 2 – agree, 3 – disagree, 4 – strongly disagree, 0 – don't know

The results from Cross-Tabulation analysis identified several statistically significant associations between the sub-sector and responses to statements about food safety culture. The association between the sub-sector of “vegetal products” and responses to the statement that food safety is a foundational value of the enterprise was significant ( $p < 0.05$ ), and the strength of this relationship was moderate ( $G = 0.464$ ). The relationship between the sub-sector of “animal products” and responses to the statement that the leaders walk the talk to demonstrate their commitment to food safety was significant ( $p < 0.05$ ), and the strength of this relationship was moderate ( $G = 0.453$ ). The association between the sub-sector of “products with a long shelf life at ambient temperature” and responses to the statement that employees are



encouraged or even rewarded for suggestions that will improve food safety was significant ( $p < 0.05$ ), and the strength of this relationship was moderate ( $G = -0.473$ ).

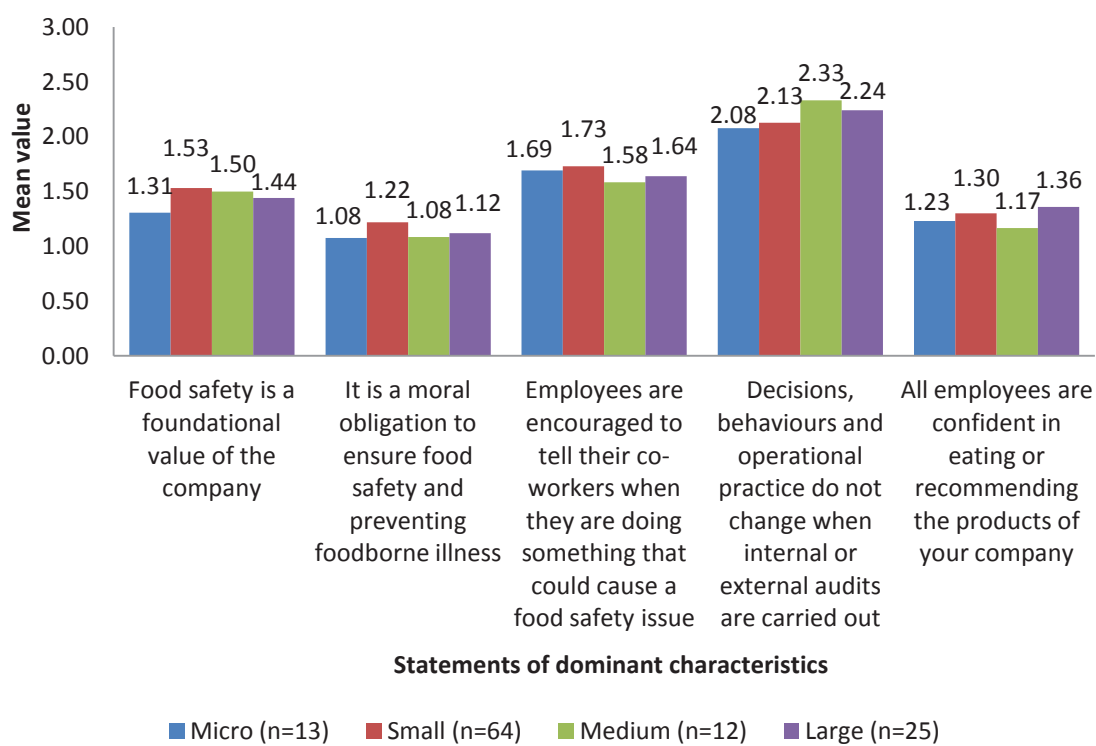
#### **8.4.3 Influence of size**

Among all respondents, micro sized respondents were the most likely to agree that food safety was a foundational value of their enterprise and that it was a moral obligation to ensure food safety and to prevent foodborne illness, while small sized respondents were the least likely to agree with these two statements (Figure 8.10).

Medium sized respondents were the least likely to agree that employees were encouraged to tell their co-workers when they were doing something that could cause a food safety issue and that all employees were confident in eating or recommending the products of their enterprise, but they were the least likely to agree that decisions, behaviours and operational practice did not change when internal or external audits were carried out. Small sized respondents were the least inclined to agree that employees were encouraged to tell their co-workers when they were doing something that could cause a food safety issue. Large sized respondents were the least inclined to agree that all employees were confident in eating or recommending the products of their company.

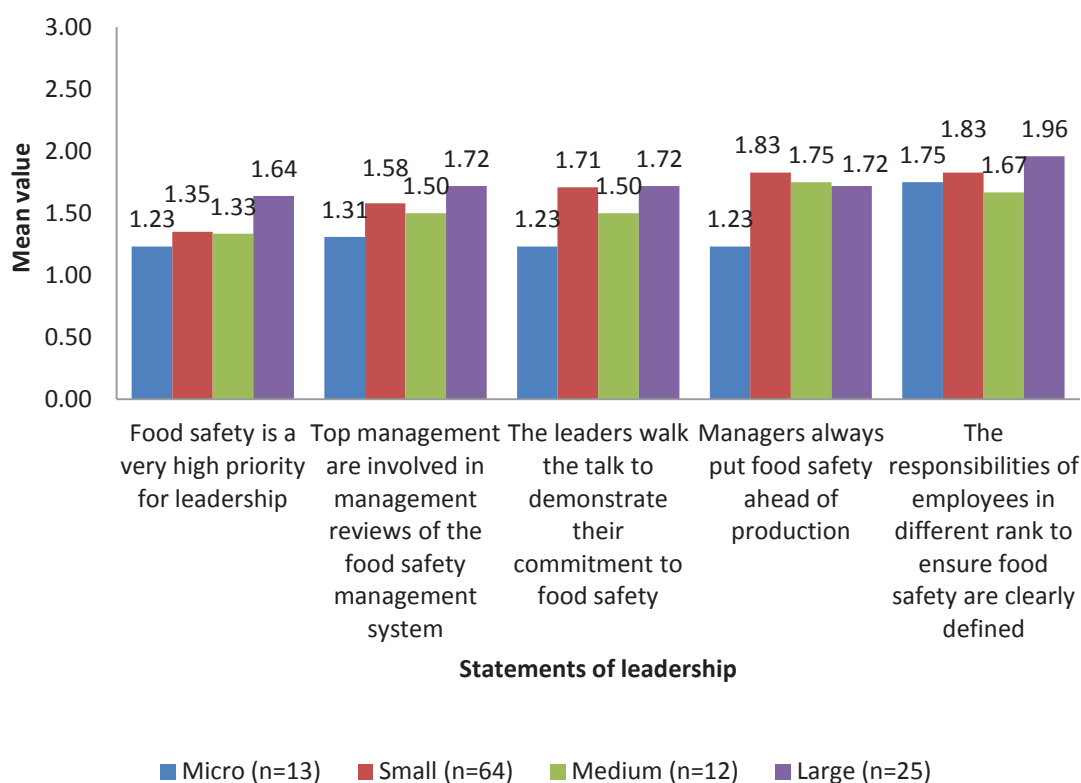
Micro sized respondents were the most likely to agree with all statements of leadership except for the statement that the responsibilities of employees in a different rank to ensure food safety were clearly defined (Figure 8.11). Medium sized respondents were the most likely to agree with that statement. Large sized respondents were the least likely to agree with all statements of leadership except for

the statement that managers always put food safety ahead of production. Small sized respondents were the least likely to agree with that statement.



**Figure 8.10: Associations between mean values for statements of dominant characteristics and size**

Note: 1 – strongly agree, 2 – agree, 3 – disagree, 4 – strongly disagree, 0 – don't know



**Figure 8.11: Associations between mean values for statements of leadership and size**

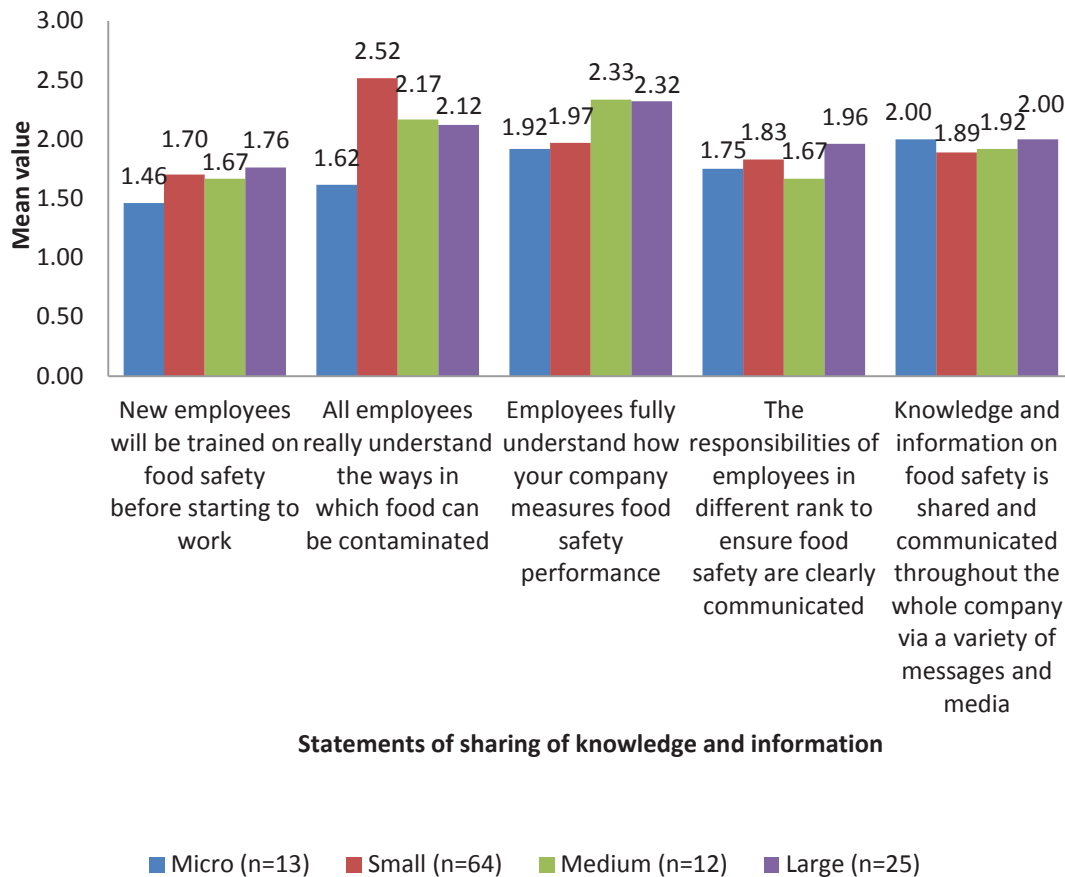
Note: 1 – strongly agree, 2 – agree, 3 – disagree, 4 – strongly disagree, 0 – don't know

The enterprise size had little impact on responses to the statement that knowledge and information on food safety was shared and communicated throughout the whole company via a variety of messages and media (Figure 8.12). Micro sized respondents were the most likely to agree that new employees were trained in food safety before starting to work, while large sized respondents were the least likely to agree with this statement. Small sized respondents were the least likely to agree that all employees really understood the ways in which food could be contaminated, and micro sized respondents were the most likely to agree with it. Micro sized respondents were also the most likely to agree that employees fully understood how their companies measured food safety performance. Medium sized respondents were the most likely to

agree that the responsibilities of employees in a different rank to ensure food safety were clearly communicated, while large sized respondents were the least likely to agree with it.

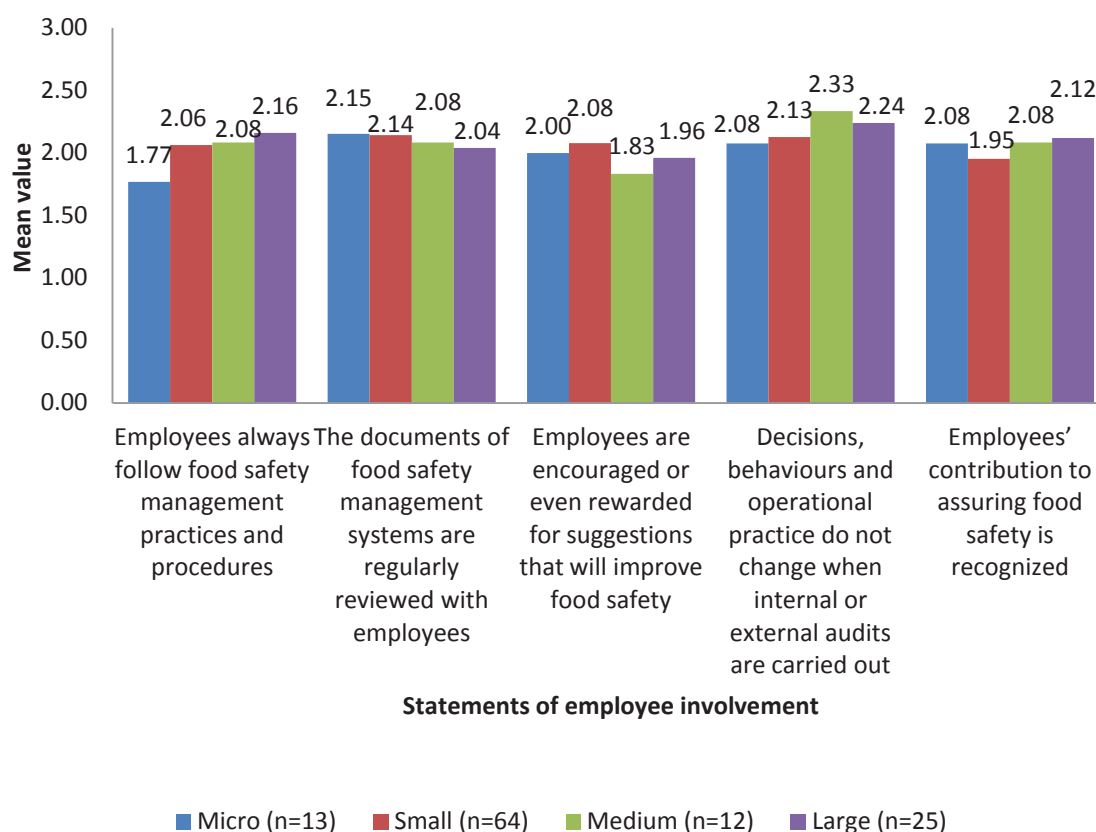
The enterprise size had little impact on responses to the statement that the documents of food safety management systems were regularly reviewed with employees (Figure 8.13). Micro sized respondents were the most likely to agree that employees always followed food safety management practices and procedures, while large sized respondents were the least likely to agree with it. Medium sized respondents were the most likely to agree that employees were encouraged or even rewarded for suggestions that could improve food safety. Small sized respondents were the most likely to agree that employees' contribution to assuring food safety was recognized.

The results from Cross-Tabulation analysis identified a statistically significant association between the enterprise size and responses to statements about food safety culture. The association between the enterprise size and responses to the statement that employees always followed food safety management practices and procedures was significant ( $p < 0.05$ ), but the strength of this relationship was relatively weak ( $G = 0.205$ ).



**Figure 8.12: Associations between mean values for statements of sharing of knowledge and information and size**

Note: 1 – strongly agree, 2 – agree, 3 – disagree, 4 – strongly disagree, 0 – don't know



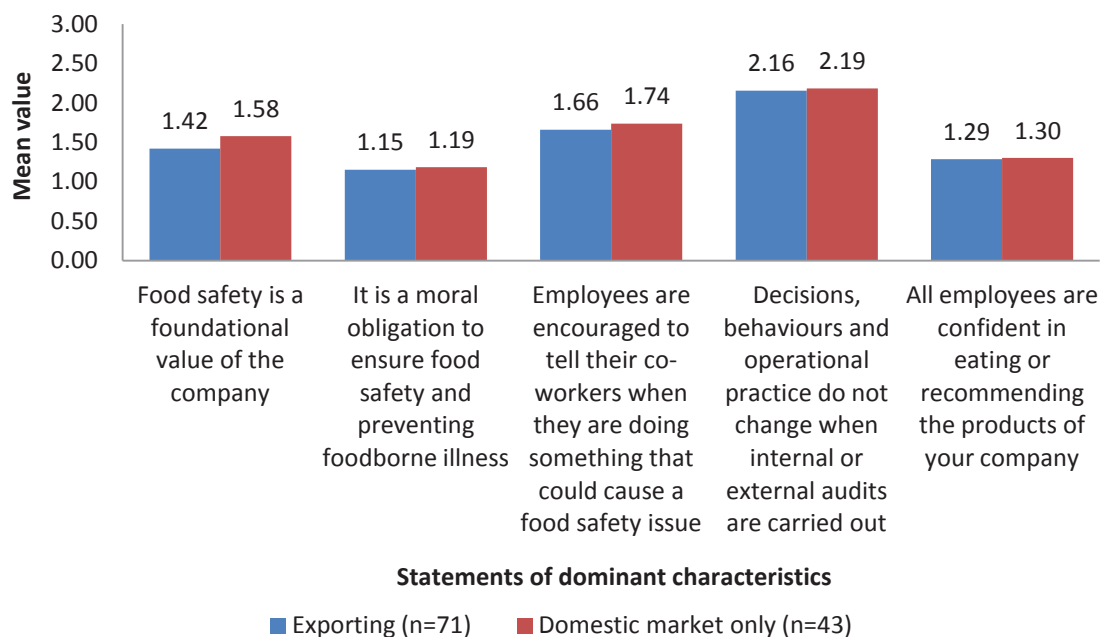
**Figure 8.13: Associations between mean values for statements of employee involvement and size**

Note: 1 – strongly agree, 2 – agree, 3 – disagree, 4 – strongly disagree, 0 – don't know

#### 8.4.4 Influence of exporting status

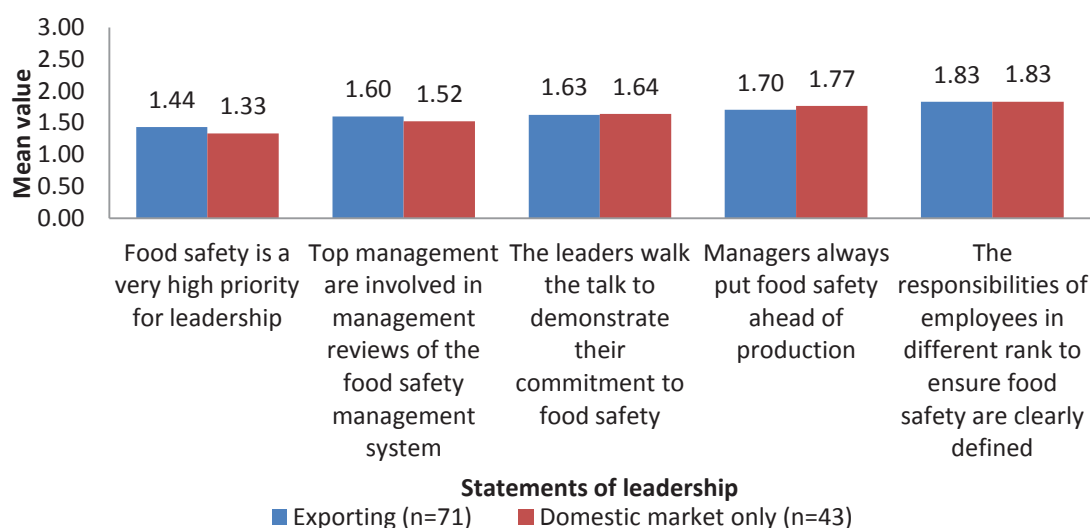
Exporting status had less impact on responses to statements of food safety culture than other enterprise characteristics (non-regulatory FSMS in place or not, sub-sector and size). The results from Cross-Tabulation analysis did not reveal any statistically significant associations between the exporting status and responses to statements of food safety culture. However, the exporting status did influence responses to certain statements of food safety culture. Exporting respondents were more likely to agree that food safety was a foundational value of the company than the domestic market focused respondents (Figure 8.14). The domestic market focused respondents were

more likely to agree that food safety was a very high priority for leadership and that top management were involved in management reviews of the FSMS (Figure 8.15). Exporting respondents were more likely to agree that new employees were trained on food safety before starting to work and that all employees really understood the ways in which food could be contaminated, while they were less likely to agree that employees fully understood how their companies measured food safety performance (Figure 8.16). Exporting respondents were also more likely to agree that employees were encouraged or even rewarded for suggestions that could improve food safety, and that employees' contribution to assuring food safety was recognized (Figure 8.17).



**Figure 8.14: Associations between mean values for statements of dominant characteristics and the exporting status**

Note: 1 – strongly agree, 2 – agree, 3 – disagree, 4 – strongly disagree, 0 – don't know



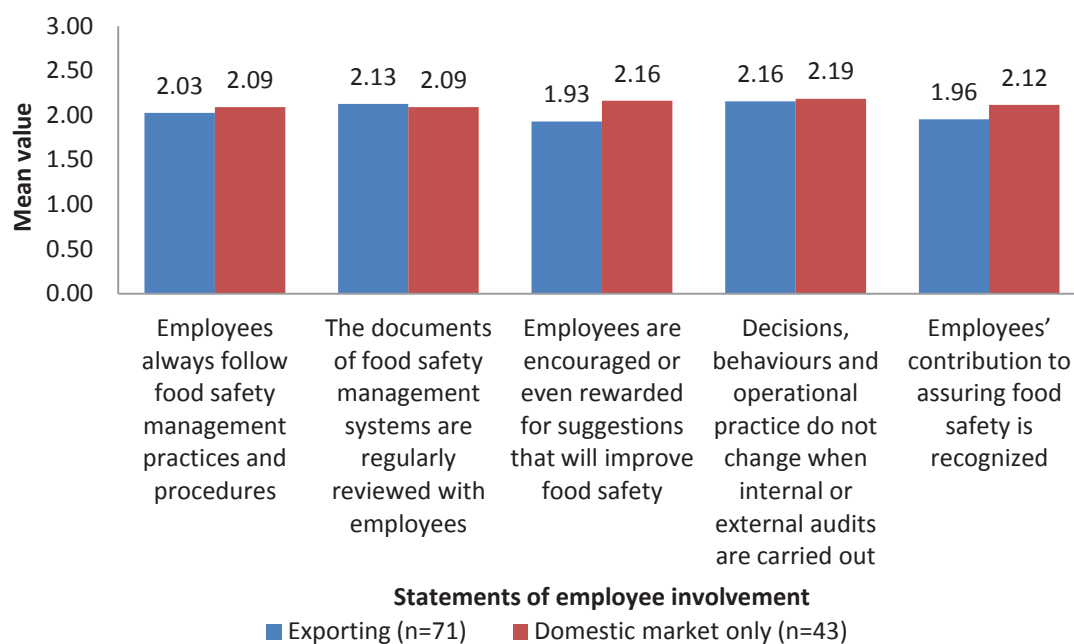
**Figure 8.15: Associations between mean values for statements of leadership and the exporting status**



**Figure 8.16: Associations between mean values for statements of sharing of knowledge and information and the exporting status**

Note: 1 – strongly agree, 2 – agree, 3 – disagree, 4 – strongly disagree, 0 – don't know





**Figure 8.17: Associations between mean values for statements of employee involvement and the exporting status**

Note: 1 – strongly agree, 2 – agree, 3 – disagree, 4 – strongly disagree, 0 – don't know

## 8.5 Discussion and conclusions

This chapter aimed to investigate the food safety culture in the food manufacturing industry in New Zealand. As food safety culture is an abstract concept and there have been few reports on how to assess food safety culture in the food manufacturing industry, the concept of food safety culture was analysed from three different levels and four dimensions. The food safety culture consists of artifacts, espoused values and basic assumptions about food safety. By analysing food safety culture from dominant characteristics, organisational leadership, sharing of knowledge and information, and employee involvement dimensions, it is possible to identify aspects of a food business that reflect the three levels of food safety culture. These results were reflected in the survey among food manufacturing firms in New Zealand. To my knowledge, this is the

first time that food safety culture has been investigated across the New Zealand food manufacturing industry.

Based on the survey results, the food safety culture in the food manufacturing industry in New Zealand is relatively robust, however there are still areas needing improvement and change. Although the percentages of respondents who disagreed with most statements on food safety culture were relatively low, these situations are worthy of concern, given they are directly related to food safety and public health. More than 90% of respondents agreed with all statements about the dominant characteristics of food safety culture except for the statement that decisions, behaviours and operational practice did not change when internal or external audits were carried out. More than 30% of respondents disagree with that statement. Such a situation compromises the role of food safety audits in ensuring food safety, and requires auditors to be capable of identifying the original decisions, behaviours and operational practices in the audited food enterprise. The assessment of food safety culture should be a component of third-party food safety audits. Although more than 96% of respondents believed that food safety was a very high priority for leadership in their enterprises, more than 15% of respondents suggested that managers did not always prioritise food safety during production in their companies. The percentages of respondents who strongly agreed with statements of sharing of knowledge and information and statements of employee involvement were low. More than 15% of respondents thought that employees did not understand the ways in which food could be contaminated and how their companies measure food safety performance. This raised the issue of food safety training. In addition, knowledge and information on food safety should be shared and communicated throughout the whole company via a variety of messages and media.

The involvement of employees in food safety culture has to be strengthened to increase their ownership of food safety management. They should be involved in the development and review of documents related to food safety management systems and the process of finding the solution to any food safety issues.

Enterprise attributes had an impact on responses to statements of food safety culture.

The implementation of non-regulatory FSMS improved the food safety culture from the dimensions of leadership, sharing of knowledge and information, and employee involvement. The results from Cross-Tabulation analysis revealed several statistically significant associations between the implementation of non-regulatory FSMS and responses to statements of food safety culture. These results verified research findings in Chapter 4. Many non-regulatory FSMS are requirements from major customers.

These influences may be driven from the customer requiring the non-regulatory FSMS, driving a culture into the manufacturing company. The sub-sector had a substantial impact on responses to statements about food safety culture. Responses from the sub-sector of “animal products” indicated that much more is needed to improve the food safety culture in this sub-sector. Employee involvement in food safety management is one aspect that must be reinforced. Responses from micro sized enterprises indicated that they had relatively stronger food safety culture than other sized enterprises.

However, the persons who filled out the questionnaire in micro sized enterprises were the directors or managers. Hence, it should be interpreted with caution. A micro sized business may have more personal control over the culture of the business. Smaller companies could also have similar personal control but if they are small start-up businesses, financial constraints may override the care and personal responsibility needed for a strong food safety culture. That is, survival becomes more important for

these companies. For larger companies, they may have good systems in place for food safety but the personal responsibility is often lost in such organisations. The exporting status had fewer impacts on responses to statements of food safety culture than other enterprise characteristics.

Food safety culture becomes particularly important when things go wrong and decisions have to be made that would not normally be needed in a day to day manufacturing environment. Such times are a test of the food safety culture.

Fonterra's precautionary recall of whey protein concentrates in August 2013 proved that there was a strong food safety culture in place. When they identified a potential food safety risk related to several batches of whey protein concentrate, questions were asked and alerts were made to government agencies, customers and consumers (Fonterra, 2013).

Although the importance of food safety culture has been identified by previous studies, few have been reported how to investigate the food safety culture in the food manufacturing industry. To my knowledge, this is the first time that food safety has been analysed from different levels and dimensions. Then food safety culture could be assessed through the questionnaire survey. This study provides a practical tool to evaluate the food safety culture across the entire food manufacturing industry, and adds substantially to the understanding of food safety culture with experimental findings in the New Zealand food manufacturing industry.

A robust food safety culture does not just emerge within a food business. It takes time to establish a strong food safety culture, and the development may proceed more slowly in some areas than in others in a food business. In order to have a robust food

safety culture, top management should fully commit to food safety management and effectively demonstrate it to all employees. The KPIs of food safety should be clearly defined in a SMART way. All employees are paid based on the results they provide to the company. The aim of execution is not finishing the task, but getting the result. The statements of result should be communicated among all employees via formal internal communication tools or systems. The responsibility for ensuring food safety should be allocated to each related department and employee. There should be one-to-one correspondence between each employee's responsibility and his/her expected result. He/she is not an onlooker of the food safety management, but a real participant who should take 100% responsibility for the result he/she provides via his/her actions. In order to achieve the employee's KPIs, tools, education and training should be provided. It's an important responsibility of top management and managers to review the behaviours and actions of employees and to make sure that their results can ensure food safety. Internal and external audits could be regarded as parts of the whole process of review. Review is the only way in which you can identify whether people are doing things wrong or right. It can also help to identify the trends in people's behaviours related to food safety. People prefer to do what will be reviewed rather than what is expected. The review should be transparent, objective, real-time and regular (e.g. weekly). It should be based on the facts and data, and focus only on issues rather than individual characters through robust and candid dialogue. Performance, the outputs of review, should be publicly linked to rewards in time. In this way, a food safety culture defines what can be valued and rewarded. It also shows all the employees what kind of behaviour is recognised and appreciated. It brings a sense of achievement to the employee, and strengthens their ownership of food safety

management. The reward is not salary; it can be material or spiritual awards, such as a positive comment or a bonus. The aim of rewarding in time is to reinforce the right behaviours of food safety management and to ultimately create a robust food safety culture in a food business. The rewards should also be communicated among all employees via formal internal communication tools or systems.



## **CHAPTER 9 DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS**

### **9.1 Introduction**

This study investigated non-regulatory food safety management in the food manufacturing industry in New Zealand. It identified non-regulatory food safety management schemes implemented by the industry, the implementation process, the factors motivating enterprises to implement non-regulatory food safety management schemes, the difference in the characteristics of enterprises (e.g. size, target market, and sub-sector) likely to participate and implement non-regulatory food safety management schemes, the influence of these enterprise characteristics on the experience of non-regulatory FSMS (e.g. challenges, costs, and benefits), and the factors influencing the effectiveness of non-regulatory food safety management schemes. A general discussion is presented first in this chapter, followed by a summary of key research findings, as well as implications and recommendations.

### **9.2 General discussion**

Food safety is a concern for government agencies, NGOs, the public, the food industry and other stakeholders along the food supply chain. This study found that non-regulatory food safety management is a key component of the entire food safety management system in New Zealand. Food and beverage manufacturing enterprises have to comply with both regulatory and non-regulatory requirements. More than 40% of responding food manufacturing enterprises had non-regulatory FSMS in place. The implementation of these non-regulatory schemes was mainly driven by the requirements of major customers, a desire to improve product quality and safety and the desire to be recognized by the industry and the public. After the implementation of



these schemes, enterprises experienced many desirable changes such as the improvement of product traceability, increasing food safety awareness of employees, satisfaction with the ability to maintain customers, decreasing cost of wastage and reduced customer complaints. In order to overcome the challenges of the increased paper work, technical knowledge and skills of employees, and resistance to change by employees, enterprises have invested in education and training, improved internal communications, and altered their organisational culture. Enterprise characteristics had notable impact on the propensity of respondents to implement non-regulatory FSMS. Food safety culture and the quality of third-party audits are vital to ensure non-regulatory FSMSs are effectively implemented.

#### **9.2.1 Food manufacturing enterprises' experiences of the implementation of non-regulatory food safety management**

In New Zealand, food and beverage manufacturers have had some similar, but also some different experiences from other countries regarding the implementation of non-regulatory FSMS. Meeting the requirements of major customers was indicated by respondents as the primary incentive to implement the non-regulatory FSMS. The same has been found in the USA where food enterprises were primarily motivated by customers' requirements to implement schemes like BRC and SQF (Crandall et al., 2012). Improving product quality and safety was the second most important incentive indicated by respondents. This is different from the findings in the UK, where product safety improvement was the most important motivation (Mensah & Julien, 2011). It is also an important driver for the food enterprises in Serbia (Tomašević et al., 2013) and China (Jin et al., 2008). During the implementation of non-regulatory FSMS, most

respondents met challenges in six areas which were related to finance, infrastructure or people. This differed from the situation in the UK where four of the top five challenges were all people related (Mensah & Julien, 2011).

The food and beverage industry has been vital to the economy of New Zealand for over 100 years. Exports of food and beverages account for more than 10 per cent of the GDP by expenditure and represent more than half of the value of all merchandise exports. Given the paramount importance of this industry, a stringent food safety regulatory system has been introduced by the government to regulate the food and beverage production for both domestic and overseas markets. However, overseas customers in the USA, EU, Australia and even Asia have extra requirements for food safety, according to respondents.

Due to the small population of the country, the domestic market for food and beverages is relatively small, and it is highly concentrated, being dominated by two main players, Progressive Enterprises and Foodstuffs. In the present survey, 78% of respondents were SMEs. Food and beverage enterprises have to target overseas markets when they are still much smaller and at an earlier stage of their business development than in other countries.

These unique characteristics of the New Zealand food and beverage industry, perhaps, help to determine the different experiences of food and beverage enterprises during the implementation of non-regulatory FSMS. To maintain current customers or gain the access to new overseas markets, the enterprises have to meet the requirements of major customers in food safety management. For the domestic market, they have to implement WQA and other approved supplier programs in order to supply Progressive

Enterprises and food service businesses such as the franchises of McDonald and KFC. For overseas markets, they have to implement HACCP, BRC, SQF, ISO 22000 etc. Many financial challenges have been encountered during the implementation of non-regulatory FSMS. Different desirable changes were experienced as a consequence of the implementation of non-regulatory FSMS, such as the improvement of product traceability, increasing food safety awareness of employees, satisfaction with the ability to maintain customers, decreasing cost of wastage and reduced customer complaints.

#### **9.2.2 The impacts of enterprise characteristics on food manufacturing enterprises' experiences of the implementation of non-regulatory food safety management schemes**

The results from this research suggest that enterprise characteristics have a substantial impact on the propensity of food manufacturing enterprises to implement non-regulatory FSMS. Respondents who produced animal products were less likely to have non-regulatory FSMS in place than those who produced vegetal products and products with a long shelf life at ambient temperature. In New Zealand, the regulatory environments are different for different sub-sectors of the food manufacturing industry. The sub-sector of “animal products” is regulated under the Animal Product Act 1999, which requires animal products manufacturing enterprises to implement a Risk Management programme. The sub-sectors of “vegetal products” and “products with long shelf life at ambient temperature” are regulated under the Food Act 1981. The requirements of the Animal Product Act 1999 are more stringent than those of the Food Act 1981. This supports one of the research hypotheses that the more mandatory regulations involved in food safety management, the fewer the food businesses that

will implement non-regulatory food safety management schemes. This finding is consistent with previous research into the associations between the industry type and the decision to implement food safety and quality management practices (Hassan et al., 2006; Henson & Holt, 2000; Herath et al., 2007; Masakure et al., 2009).

Enterprise size and exporting status had substantial impact on the decision of respondents to implement those schemes. Large respondents and exporting respondents were more likely to implement the schemes. This could be explained by the fact that a larger food company has a lot more to lose from a food safety incident, and that they have more resources than a smaller company. Larger enterprises could have cost advantages in regard to the implementation of non-regulatory schemes. Thus, large enterprises are likely to invest in food safety and quality management and implement non-regulatory FSMS. Most of the customer requirements are embedded into non-regulatory schemes. Hence, exporting enterprises must have certain non-regulatory FSMS in place in order to gain or maintain the access to overseas markets.

The notable impact of enterprise characteristics on the propensity of food manufacturing enterprises to implement non-regulatory FSMS was also supported by the fact that these characteristics made a substantial difference to the relative importance of different incentives to implement non-regulatory FSMS, as well as the food manufacturing enterprise's experiences (strategies, changes and challenges) of the implementation of non-regulatory FSMS.

The research findings suggested that these characteristics could influence the importance of most incentives as ranked by the respondents for certain traits. The relative order of importance for incentives differed for the respondents in different

groups although the most important driver for all respondents was “meeting major customers’ requirements”.

Different strategies were chosen by respondents with different attributes to implement these schemes. The human resources differ in different enterprises. Large enterprises have an advantage in being able to hire and retain technically competent and experienced employees. They are then in a position to develop their systems in house. In the food manufacturing industry of New Zealand, the sub-sector of “animal products” is more developed than the other two sub-sectors. For instance, the dairy industry is world-leading in process technology, and a risk-based food safety management system is in place (Archer, 2013). There are more experienced employees in enterprises in the sub-sector of “animal products” than the other two sub-sectors. Therefore they can develop their system by using their own employees. The sub-sector had more impact on changes in food safety and quality management and production costs following the implementation of non-regulatory FSMS, while it had little impact on changes in the market performance and relationships with customers.

Enterprise size had a notable influence on changes in food safety and quality management, and market performance, while it had less notable impacts on changes in production costs and customer relationships. Large respondents experienced less notable changes in food safety and quality management and market performance following the implementation of non-regulatory FSMS than others. Large enterprises are likely to invest in food safety and quality management even if they do not

implement non-regulatory FSMS, because a large food company has a lot to lose from a food safety incident.

The exporting status had some impact on changes in food safety and quality management and market performance. Domestic market focused respondents experienced more substantial improvements in food safety and quality management than the export focused enterprises. Exporting respondents improved their ability to attract new customers and to have access to overseas markets, while domestic market focused respondents were more satisfied with access to the domestic market.

Enterprise attributes had an impact on whether respondents met challenges in certain areas; however, the six most challenging areas were the same for each group, which were increased paper work, cost of development and implementation, technical knowledge and skills of employees, resistance to change by employees, cost of training and education, and access to adequate information. Although the financial and human resources differed in different enterprises, most of them faced similar challenges during the implementation of non-regulatory FSMS.

### **9.2.3 Factors influencing the effectiveness of non-regulatory food safety**

#### **management schemes**

Top management commitment to food safety was the most important factor influencing the effectiveness of non-regulatory food safety management schemes. This is in agreement with the finding of Mensah and Julien (2011) which showed top management commitment was the most highly ranked successful implementation factor of the food safety management system. Top management commitment can

ensure the acceptance of employees and enough support such as financial investment to implement food safety management schemes.

Employee's attitude and commitment to food safety and food safety knowledge are the second most important factors. These two were also highly ranked as critical factors for effective implementation of HACCP by respondents to a survey in Greece (Fotopoulos et al., 2009). In this survey, human resource management, infrastructure and the quality of third-party audits were rated by respondents as somewhat important factors.

Most of these factors are related to the food safety culture in food and beverage manufacturing enterprises. The food safety culture can fundamentally impact day-to-day decisions, behaviours and practices that help to effectively implement a food safety management system (Seward et al., 2012).

#### **9.2.4 Food safety culture**

The food safety culture consists of artifacts, espoused values and basic assumptions of food safety. It is also a multi-dimensional concept, which can be analysed from four dimensions: dominant characteristics, organisational leadership, sharing of knowledge and information, and employee involvement.

Food safety should be an integral part of the organisational culture of a food business, so as to effectively execute food safety management. In other words, those involved in the food business need to care about the safety of their products. This goes beyond following government rules and regulations. Ideally, employees and management need to take personal responsibility for food safety. It becomes particularly important when things go wrong and decisions have to be made that would not normally be needed in

a day to day manufacturing environment. Such times are a test of the food safety culture. Fonterra's precautionary recall of whey protein concentrates in August 2013 proved that there was a strong food safety culture in place. When they identified a potential food safety risk related to several batches of whey protein concentrate, questions were asked and alerts were made to government agencies, customers and consumers (Fonterra, 2013).

The survey results suggest that the food safety culture in the food manufacturing industry in New Zealand is relatively robust. To my knowledge, this is the first time that the concept of a food safety culture has been investigated across the food manufacturing industry. There are still areas that could be improved. Although the percentage of respondents who disagreed with most statements about the food safety culture were relatively low, these situations are worthy of concern, given they are directly related to food safety and public health.

More than 90% of respondents agreed with all statements relating to the dominant characteristics of food safety culture except for the statement that decisions, behaviours and operational practice did not change when internal or external audits were carried out. More than 30% of respondents disagreed with that statement. Such a situation compromises the role of food safety audits in ensuring food safety, and requires auditors to be capable of identifying the original decisions, behaviours and operational practices in the audited food enterprise. Around 15% of respondents suggested that managers did not always prioritise food safety during day to day operation in their enterprises.



More than 15% of respondents indicated that employees did not understand the ways in which food could be contaminated and how their enterprises measure food safety performance. This raised the issue of food safety training. Food safety training has to ensure that all employees are able to really understand the ways in which food can be contaminated. Only if they know the reasons behind food safety management practices and procedures, will they fully follow these practices and procedures instead of only doing what they are told and required by managers. In addition, knowledge and information on food safety should be shared and communicated throughout the whole company via a variety of messages and media.

The involvement of employees in food safety culture has to be strengthened to increase their ownership of food safety management. They should be involved in the development and review of documents related to food safety management systems and the process of finding the solution to any food safety issue, in particular, the assessment of food safety risks. This would also be an active learning process.

Enterprise attributes had an impact on responses to statements on food safety culture. The implementation of non-regulatory FSMS improved the food safety culture from the dimensions of leadership, sharing of knowledge and information, and employee involvement. This research found several statistically significant associations between the implementation of non-regulatory FSMS and responses to statements on food safety culture. Many non-regulatory FSMS are requirements from major customers. These influences may be driven from the customer requiring the non-regulatory FSMS, driving a culture into the manufacturing company. The sub-sector (animal products, vegetal products, and products with a long shelf life at ambient temperature) had a

substantial impact on responses to statements on food safety culture. Responses from the sub-sector of “animal products” indicated that much more was needed to improve the food safety culture in this sub-sector. Employee involvement in food safety management was one aspect that must be reinforced. Responses from micro sized enterprises indicated that they had a relatively stronger food safety culture than enterprises of other sizes. A micro sized business may have more personal control over the culture of the business. Smaller enterprises may have tight control over their personnel but if they are small start-up businesses, financial constraints may override the importance of care and personal responsibility needed for a strong food safety culture. Survival becomes more important for these enterprises. For larger enterprises, they may have good systems in place for food safety but personal responsibility is often lost in such organisations. Exporting status had fewer impacts on responses to statements of food safety culture than other enterprise characteristics.

#### **9.2.5 Third-party food safety audit**

As an effective tool of enforcement, third-party audits have been involved in non-regulatory FSMS since they were first introduced. The third-party food safety audit works as an independent and objective institution of enforcement to provide assurance of the implementation of non-regulatory FSMS. It offers information about the conformity of food manufacturing enterprises to stakeholders along the food supply chain.

Through the involvement of third-party audits, the responsibility of ensuring food safety is shared among stakeholders along the food supply chain. When the third-party food safety audit is used properly as a tool to improve food safety management,

it is very effective in facilitating continuous improvement in food safety management and could lift up the level of food safety management in food manufacturing businesses. Auditors should be able to provide guidance to senior management of food businesses on gaps and opportunities in their food safety management systems. Food businesses could work proactively on these gaps and food safety risks to prevent food safety issues and losses.

The quality of third-party food safety audits can be influenced by accreditation, competition in the certification market, the competency and integrity of auditors, audit scope, audit time, and surveillance activities of scheme owners. Accreditation is important to ensure the independence and objectivity of certification bodies.

Increasing competition among certification bodies could negatively affect the objectivity and neutrality of the audit process, and compromise the audit quality. If certification bodies have to be approved by scheme owners to perform respective audits or certification services (such as the situation of the BRC and WQA), the number of certification bodies can be controlled in certain regions or nations. This will control the level of competition in those areas.

Technical knowledge and audit skills of auditors are vital to the audit quality. The standards of non-regulatory FSMS *per se* have an impact on the audit quality, as they determine the audit scope. A relative balance between formalization of the audit practices and the auditor's own discretion should be identified to ensure a desirable level of audit integrity and to empower auditors to make independent and objective judgements.

All certification bodies responding to the survey indicated that reducing audit time could undermine the audit quality. Based on the guidance from the scheme owner and the specific situation of the auditee, certification bodies have to optimise the audit time. The scheme owners could conduct a series of activities to monitor the performance of approved certification bodies to ensure that these certification bodies meet key performance targets and other requirements of competency and capability.

### **9.3 Conclusions**

#### **9.3.1 Motivation to implement non-regulatory food safety management schemes in**

##### **New Zealand**

Non-regulatory food safety management is a key component of the entire food safety management system in New Zealand. More than 40% of responding food manufacturing enterprises had non-regulator FSMS in place. The implementation of these non-regulatory schemes was mainly driven by major customers' requirements, a desire to improve product quality and safety and the desire to be recognized by the industry and the public.

#### **9.3.2 Food manufacturing enterprises' experiences of the implementation of non-regulatory food safety management**

After the implementation of these schemes, enterprises experienced many desirable changes such as the improvement of product traceability, increasing food safety awareness of employees, satisfaction with the ability to maintain customers, decreasing cost of wastage and reduced customer complaints. Notably, the implementation of non-regulatory FSMS improved the food safety culture from

dimensions of leadership, sharing of knowledge and information, and employee involvement.

The major challenges encountered during the implementation of non-regulatory FSMS were increased paper work, record keeping and documentation, and the cost of development and implementation. Enterprises invested in education and training, improved internal communications, and altered their organisational culture to overcome these challenges. The costs of system design and development, and external audit fees were the major implementation costs of non-regulatory FSMS, while external surveillance audit fees and product testing were the significant operating costs.

### **9.3.3 Impacts of enterprise characteristics on food manufacturing enterprises' experiences of the implementation of non-regulatory food safety management schemes**

Enterprise characteristics have a substantial impact on the propensity of food manufacturing enterprises to implement non-regulatory FSMS. Respondents who produced vegetal products or products with a long shelf life at ambient temperature were more likely to implement these schemes, while respondents who manufactured animal products were less likely to have these schemes in place. Large respondents and exporters were more likely to implement those schemes. One of the reasons behind this notable influence was that these characteristics (sub-sector, size and exporting status) made a substantial difference to the relative importance of different incentives to implement non-regulatory FSMS, and to food manufacturing enterprise's

experiences (strategies, changes and challenges) of the implementation of non-regulatory FSMS.

#### **9.3.4 Factors influencing the effectiveness of non-regulatory food safety management schemes**

The effectiveness of non-regulatory food safety management schemes was largely influenced by the food safety culture in the food manufacturing enterprises and the quality of third-party food safety audits. A relatively robust food safety culture is evident in the food manufacturing industry in New Zealand, although there are areas needing improvement and change. Enterprise attributes made a substantial difference to the responses to statements on the food safety culture. The quality of third-party food safety audits could be affected by accreditation, competition in the certification market, the competency and integrity of auditors, audit scope, audit time, and the surveillance activities of scheme owners.

This study provides new information with empirical evidence from the New Zealand food manufacturing industry. It provides a thorough understanding of the process by which food manufacturing enterprises comply with non-regulatory FSMS, including what motivates food businesses to participate and comply with non-regulatory food safety schemes and how to maximise benefits to food businesses obtained from the implementation of these schemes. Moreover, this study provides the baseline information on the implementation of non-regulatory food safety management schemes in New Zealand, which will benefit future research on this topic and can provide support for trade negotiations involving food safety management.

## **9.4 Research recommendations**

### **9.4.1 Recommendations**

#### **9.4.1.1 Recommendations for government agencies**

Government agencies should consider the current status of non-regulatory food safety management when they formulate food safety regulating policies, since non-regulatory FSMS have been played an important role as identified in this study. One feasible option is to accept and recognize the results of non-regulatory food safety audits and to build a new public-private food safety regulatory paradigm. In this way, the compliance cost to the food industry could decrease, and the government agencies could utilize their limited budget more effectively. However, the quality of third-party is of concern, so measures should be taken to supervise the activities of third-party certification bodies.

The liability of certification bodies should be clarified and emphasised when a foodborne illness outbreak happens since they have to been paid to conduct food safety audits as found in this study. Then certification bodies have to improve the quality of their food safety audit to reduce the likelihood of liability claims. On the other hand, it may increase the government budget to oversee the activities of certification bodies, and it may discourage the involvement of certification bodies in to food safety governance.

Food safety culture should be addressed when food safety authorities make policy on food safety control since it is crucial to the effectiveness of food safety management as found in this study. Food safety regulations and policies should be specific to different types of food manufacturing enterprises.

#### **9.4.1.2 Recommendations for the scheme owners**

This study found that food manufacturing enterprises had been driven by different enablers to implement non-regulatory FSMS and encountered different challenges, and that many factors can influence the effectiveness of non-regulatory FSMS. When the owners of non-regulatory FSMS or standard setting agencies set out schemes, more attention should be paid to the drivers that motivate food businesses to implement non-regulatory FSMS, the challenges encountered by food businesses and the critical factors influencing their effectiveness. In this way, the scheme can be implemented by more food manufacturing enterprises. In addition, food safety culture should be addressed particularly in standards or specifications since it is vital to the effectiveness of non-regulatory FSMS as found in this study.

The scheme owner should also take into account the impact of enterprise demographics on a food manufacturing enterprise's decision to implement non-regulatory FSMS since it has been found in this study that enterprise demographics could impact a food manufacturing enterprise's decision. The specific environments and food safety risk profiles of different sub-sectors of the food industry should be reflected in the standards or specifications of these schemes.

The implementation costs of these schemes can be reduced by optimising the implementation processes since it has been identified in this study that cost could be challenging for certain food enterprises. For instance, publicly available and detailed guidance for different sized food manufacturing enterprises on how to implement these schemes should be developed and provided to enterprises. More user-friendly standards should be compiled to decrease the cost of implementation in smaller sized enterprises. The scheme could then reach the targeted food manufacturing enterprises more readily.



It has been found in this study that scheme owners could take many measures to improve the quality of food safety audits. Practices such as naming and shaming the failed certification bodies should be introduced by the scheme owner. The requirements of auditors should be more stringent in order to ensure their consistency and competency. Auditors should be capable of identifying the original decisions, behaviours and operational practices in the audited food enterprises.

#### **9.4.1.3 Recommendations for the food manufacturing industry**

Food manufacturing enterprises should strive to build a robust food safety culture as it has been identified in this study as an decisive factor for food safety management. A proprietary, single and specific food safety management system has to be developed and implemented, no matter how many non-regulatory FSMS and regulatory requirements they have to comply with. Top management should fully commit to food safety management and effectively demonstrate it to all employees. The KPIs of food safety should be clearly defined in a SMART way. The responsibility for ensuring food safety should be allocated to each related department and employee. There should be one-to-one correspondence between each employee's responsibility and his/her expected performance. He/she is not an onlooker of food safety management, but a real participant who should take 100% responsibility for the result he/she provides via his/her actions. In order to achieve the employee's KPIs, tools, education and training should be provided. Knowledge and information on food safety needs to be shared and communicated throughout the whole company via a variety of messages and media. After training, all employees should really understand the ways in which food can be contaminated. During the food safety training, the ramifications of poor food safety management should be included to demonstrate its adverse impact on business

performance, production efficiency and production costs. Training should involve active learning where participants participate in exercises that represent potential food safety threats. The training should be combined with field trips to show each worker the importance of every procedure, and enable employees to fully understand their own impact on the overall performance of food safety management. Top management and managers should review the behaviours and actions of employees and make sure that their work and practices can ensure food safety. Performance and the outputs of reviews should be publicly linked to rewards. In this way, a food safety culture defines what can be valued and rewarded. It brings a sense of achievement to the employee, and strengthens their ownership of food safety management. The rewards should also be communicated among all employees via formal internal communication tools or systems. Decisions, behaviours and operational practice should not change when internal or external audits are carried out, in order to maximize the benefits of food safety audits.

#### **9.4.1.4 Recommendations for the third-party certification bodies**

It has been found in this study that certification bodies could take many measures to improve the quality of food safety audits. Third-party certification bodies should adopt a risk oriented auditing practice. The impact of enterprise demographics on food manufacturing enterprise's experiences (strategies, changes and challenges) of non-regulatory FSMS should be included in the risk assessment of different types of food manufacturing enterprises. Certification bodies should try to provide combined audit services which can complete several non-regulatory FSMS via a single audit and hence lower cost. They should invest more in auditors' capacity building to ensure their competency and consistency. Food safety culture should be paid more attention when

food safety audits are conducted. Judgements are better made not only from the direct evidences, but also from the status of the food safety culture.

#### **9.4.2 Further work**

One area that remains to be investigated is the governing structure of owners of non-regulatory food safety management schemes. The economic impact of non-regulatory food safety management schemes on the food industry are equally worthy of quantitative investigation. Based on current research findings in relation to food safety culture, the assessment of the food safety culture in a food business could be investigated in more detail.

#### **9.5 Limitations**

There are several limitations of this study. A complete list of food manufacturing enterprises was not able to be obtained free in New Zealand. The list of 419 food manufacturers compiled from free open source information may not represent the entire food manufacturing industry of New Zealand. The person who filled out questionnaires is supposed to be a food safety or quality manager of food business. There may be some bias about their responses to certain questions (e.g. food safety culture). Due to the limited research budget and time, only seven interviews were conducted for the case studies.

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## APPENDICES

### Appendix A Letter of low risk notification



15 May 2012

Encheng Chen  
Doctoral Student  
c/o IFNHH  
PN452

Dear Encheng

**Re: Voluntary Food Safety Management in New Zealand**

Thank you for your Low Risk Notification which was received on 8 May 2012.

Your project has been recorded on the Low Risk Database which is reported in the Annual Report of the Massey University Human Ethics Committees.

The low risk notification for this project is valid for a maximum of three years.

Please notify me if situations subsequently occur which cause you to reconsider your initial ethical analysis that it is safe to proceed without approval by one of the University's Human Ethics Committees.

Please note that travel undertaken by students must be approved by the supervisor and the relevant Pro Vice-Chancellor and be in accordance with the Policy and Procedures for Course-Related Student Travel Overseas. In addition, the supervisor must advise the University's Insurance Officer.

A reminder to include the following statement on all public documents:

*"This project has been evaluated by peer review and judged to be low risk. Consequently, it has not been reviewed by one of the University's Human Ethics Committees. The researcher(s) named above are responsible for the ethical conduct of this research."*

*If you have any concerns about the conduct of this research that you wish to raise with someone other than the researcher(s), please contact Professor John O'Neill, Director (Research Ethics), telephone 06 350 5249, e-mail [humanethics@massey.ac.nz](mailto:humanethics@massey.ac.nz)."*

Please note that if a sponsoring organisation, funding authority or a journal in which you wish to publish requires evidence of committee approval (with an approval number), you will have to provide a full application to one of the University's Human Ethics Committees. You should also note that such an approval can only be provided prior to the commencement of the research.

Yours sincerely,

John G. O'Neill (Professor)  
Chair, Human Ethics Chairs' Committee and  
Director (Research Ethics)

cc: Assoc Prof Stephen Flint  
IFNHH  
PN452

Dr Robert Lau  
IFNHH  
Wellington

Prof Richard Archer, HoI  
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## Appendix B Cover letter and questionnaire for food manufacturing enterprises

### B.1 Survey cover letter



August 2012

Dear Sir/Madam,

I am writing to invite your organization to participate in a study on non-regulatory food safety management in the food industry. I am Encheng Chen, a PhD student in the Institute of Food, Nutrition and Human Health, Massey University. **My PhD Study is supported by the New Zealand China Food Safety Scholarship provided by the New Zealand Ministry of Foreign Affairs and Trade, and is supervised by Associate Professor Steve Flint, Dr Paul Perry, Associate Professor Martin Perry and Dr Robert Lau.**

This survey is a key part of the research for my PhD thesis. The purpose of this survey is to explore the implementation of non-regulatory food safety management schemes in the food industry in New Zealand. The findings of the survey will help to maximize the implementation and effectiveness of non-regulatory food safety management, and **to provide insights into implications for pragmatic programme design and government policy which can encourage all stakeholders to contribute to the food safety management.** Non-regulatory food safety management schemes are those programs developed to encourage food businesses to enforce their food safety management over and above the mandatory food safety requirements set by government. Examples of such schemes are HACCP, ISO 22000 Food Safety Management System (FSMS), British Retail Consortium (BRC) Global standard for Food Safety, and schemes developed by individual retailers or manufacturers, such as Woolworths and Tesco.

The information being collected is important for understanding your experiences with non-regulatory food safety management. **Your participation is completely voluntary; however, your views are very important for this study. The survey should be filled out by the Quality Assurance Manager. If you are not the Quality Assurance Manager, please forward this survey to the right person.**

The survey is not short, but it should not take more than 45 minutes to complete. **Please be assured that all of the information you provide will remain completely confidential.** No information identifying the individual or company will be made available to other parties or published. You could decline to answer any particular question. Completion and return of the questionnaire implies consent.

This project has been evaluated by peer review and judged to be low risk. Consequently, it has not been reviewed by one of the University's Human Ethics Committees. The researcher(s) named above are responsible for the ethical conduct of this research. If you have any concerns about the conduct of this research that you wish to raise with someone other than the researcher(s), please contact Professor John O'Neill, Director, Research Ethics, telephone 06 350 5249, email: [humanethics@massey.ac.nz](mailto:humanethics@massey.ac.nz).

If you have any questions or concerns about the questionnaire or how to fill it out, please feel free to contact me at the address, phone number or email listed below.

Thank you for your time and participation in this survey.

Yours sincerely,

Encheng Chen  
PhD student  
Institute of Food Nutrition and Human  
Health, Massey University  
Tel: (06) 356-9099 extn.81409  
Mob: (021) 136-9090  
Email: [e.chen1@massey.ac.nz](mailto:e.chen1@massey.ac.nz)

Steve Flint  
Associate Professor  
Director (Food Science and Technology)  
Institute of Food Nutrition and Human  
Health, Massey University  
Tel: (06) 356 9099 extn. 81418  
Email: [s.h.flint@massey.ac.nz](mailto:s.h.flint@massey.ac.nz)

## B.2 Survey questionnaire



**CONFIDENTIAL**

ID: \_\_\_\_\_



# NON-REGULATORY FOOD SAFETY MANAGEMENT IN NEW ZEALAND

The Institute of Food, Nutrition and Human Health (IFNHH)  
Massey University

## How to fill out this questionnaire

To answer these questions all you have to do is tick (✓) a box, circle a number or write in the space provided. After certain questions, there is a brief introduction in **bold type** explaining what to do.

You can choose to fill out this hard copy questionnaire or finish the survey online by connecting to the following link. If you want the electronic edition of the link, please feel free to email me at the address listed below.

[http://masseybusiness.eu.qualtrics.com/SE/?SID=SV\\_6Vas7FuxQz96IO4](http://masseybusiness.eu.qualtrics.com/SE/?SID=SV_6Vas7FuxQz96IO4)

or <http://goo.gl/aOzOz>

The questionnaire asks you about a variety of subjects on current food safety management system in your company, such as motivation, challenges, food safety culture, and external audit quality.

Some questions may require special knowledge. **The survey should be filled out by the Quality Assurance Manager.**

Your participation is completely voluntary, but we are very grateful for your help. **All the information collected is completely confidential.**

## Returning the questionnaire

If you finish this survey online, the questionnaire will be sent back to us automatically. Otherwise, when you have filled out the hard copy questionnaire, please post it back in the FreePost envelope as soon as possible.

Thank you very much for your help.

Encheng Chen  
Institute of Food, Nutrition and Human Health  
Massey University  
Palmerston North  
Tel: (06) 356-9099 extn. 81409  
Mob: (021) 136-9090  
Email: [e.chen1@massey.ac.nz](mailto:e.chen1@massey.ac.nz)



1. Please select one situation which best describes your firm's food safety management system.

- ☐ 1 Your firm has non-regulatory food safety management schemes in place → Please continue filling out part I on this page
- ☐ 1 Your firm has no non-regulatory food safety management schemes but a registered Risk Management Programme (RMP) in place → Please go to part II on Page 9
- ☐ 1 Your firm has no non-regulatory food safety management schemes but a registered Food Safety Programme (FSP) in place → Please go to part II on Page 9
- ☐ 1 There is neither RMP (or FSP) nor any non-regulatory food safety management scheme in place → Please go to part III on Page 10

## PART I THE IMPLEMENTATION OF NON-REGULATORY FOOD SAFETY MANAGEMENT SCHEMES

### SECTION A. General information

2. What kinds of non-regulatory food safety management systems are in place in your company? Please tick all that apply.

- ☐ 1 Hazard Analysis and Critical Control Point (HACCP) ☐ 1 ISO 22000 Food Safety Management System (FSMS)
- ☐ 1 British Retail Consortium (BRC) Global Standard for Food Safety ☐ 1 International Featured Standards Food (IFS Food)
- ☐ 1 Safe Quality Food (SQF) Program ☐ 1 Woolworths Quality Assurance (WQA)
- ☐ 1 Food Safety System Certification (FSSC) 22000
- ☐ 1 Others (please specify):

3. How long have those non-regulatory food safety management systems been in place in your company?

Names of the food safety management systems in place	Time (e.g. since 1999)
	Since
	Since
	Since
	Since
	Since
	Since



4. How did your company develop these non-regulatory food safety management systems? **Please tick one that best describes your firm's situation.**

- ☐ <sub>1</sub> Developing systems in-house (own employees)
- ☐ <sub>2</sub> Hiring a consultant to develop systems
- ☐ <sub>3</sub> Jointly developing systems, while making use of both in-house employees and a consultant
- ☐ <sub>4</sub> Using templates or models provided by government agencies or industry associations

5. How long did it take to develop and implement your non-regulatory food safety management systems before getting a successful audit/inspection carried out by third-party conformity assessment bodies?

Names of the food safety management systems in place	Time it took to get a successful audit/inspection
	months
	months
	months
	months
	months
	months

6. A new law, replacing the Food Act 1981, is before Parliament. If passed into law, the Food Bill would replace the Food Act 1981 and introduce some fundamental changes to New Zealand's domestic food regulatory regime, e.g. a risk-based approach to food safety. If the proposed Food Bill is passed into law, how do you think it will affect your firm's decision to implement non-regulatory food safety management schemes?

- ☐ <sub>1</sub> Your firm will implement fewer of non-regulatory schemes
- ☐ <sub>2</sub> No change
- ☐ <sub>3</sub> Your firm will implement more of non-regulatory schemes
- ☐ <sub>4</sub> Don't Know

7. Listed below are four broad kinds of non-regulatory food safety schemes developed by different kinds of organisations. **Please rank the four types in terms of how effective you think each is in helping to ensure food safety, from the most effective (1), to the least effective (4).**

- Private schemes, e.g. 2nd party schemes such as WQA ☐
- Public schemes by industry sector e.g. BRC, SQF, IFS, FSSC 22000 ☐
- Public international standard schemes, e.g. ISO 22000 ☐
- Private (or public) non-accredited schemes, e.g. 2nd party or CAB owned schemes ☐

**SECTION B. Motivations, challenges, costs and benefits**

8. Listed below are several **regulatory and liability incentives or motivations** which may drive the decision to implement non-regulatory food safety management schemes. Please rate the importance of each item based on the reasons your firm has for its implementation of non-regulatory food safety management schemes. **PLEASE TICK ONE BOX ON EACH LINE**

	Very important	Somewhat important	Slightly important	Unimportant	Don't know
Meeting regulatory requirements in a cost-effective way	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 0
Reducing the likelihood of liability claims	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 0
Meeting the requirements of insurance	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 0

9. Listed below are several **market-based incentives or motivations** which may drive the decision to implement non-regulatory food safety management schemes. Please rate the importance of each item based on the reasons your firm has for its implementation of non-regulatory food safety management schemes. **PLEASE TICK ONE BOX ON EACH LINE**

	Very important	Somewhat important	Slightly important	Unimportant	Don't know
Meeting major customers' requirements	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 0
Enhancing marketing advantages	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 0
Attracting new customers	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 0
Access to new overseas markets	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 0
Competitors are certified	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 0
Improved corporate image	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 0
Reducing quality audits by customers	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 0

10. Listed below are several **improvement-driven incentives or motivations** which may drive the decision to implement non-regulatory food safety management schemes. Please rate the importance of each item based on the reasons your firm has for its implementation of non-regulatory food safety management schemes. **PLEASE TICK ONE BOX ON EACH LINE**

	Very important	Somewhat important	Slightly important	Unimportant	Don't know
Generally regarded as good practice	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 0
Improving product quality and safety	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 0
Improving production efficiency	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 0
Prospect of operational cost reductions	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 0

11. Listed below are several **aspects of food quality and safety management** in a food business which may change as a consequence of the implementation of non-regulatory food safety management schemes. Please rate the changes of each item on a 5-point scale according to the experience of your company.

PLEASE TICK ONE BOX ON EACH LINE

	Greatly decreased	Slightly decreased	Stayed at the same	Slightly increased	Greatly increased
Level of product quality and safety	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Product traceability	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Quality of data for decision making	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Quality of internal procedures	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
The awareness of employees of food hygiene and safety	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Product failure rate	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Number of product recalls	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5

12. Listed below are several **items of market performance** in a food business which may change as a consequence of the implementation of non-regulatory food safety management schemes. Please rate the changes of each item on a 4-point scale according to the experience of your company.

PLEASE TICK ONE BOX ON EACH LINE

	Stayed at the same	Slightly increased	Greatly increased	Not Applicable
Satisfaction with the ability to maintain customers	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 0
Ability to attract new customers	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 0
Satisfaction with access to the domestic market	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 0
Satisfaction with access to the overseas market	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 0

13. How have the **costs of production** changed as a consequence of the implementation of non-regulatory food safety management schemes. Please rate the changes of each item on a 5-point scale according to the experience of your company.

PLEASE TICK ONE BOX ON EACH LINE

	Greatly decreased	Slightly decreased	Stayed at the same	Slightly increased	Greatly increased
Cost of wastage	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Cost of record keeping	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Cost of monitoring production process	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Cost of laboratory analysis	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Cost of training	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Cost of an internal audit	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Cost of a product recall	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5

14. How have the **relationships with your customers** changed as a consequence of the implementation of non-regulatory food safety management schemes. Please rate the changes of each item on a 5-point scale according to the experience of your company.

PLEASE TICK ONE BOX ON EACH LINE

	Greatly decreased	Slightly decreased	Stayed at the same	Slightly increased	Greatly increased
Number of customers	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Average number of audits per customer per year	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Frequency of working with customers on food safety assurance	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Likelihood that customers audit/inspect your firm before signing contracts	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Time spent with customers to negotiate contracts	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Tendency to sign long-term contracts with customers	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Frequency of customer complaints	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5

15. Listed below are a number of areas in which food processing firms may encounter challenges during the implementation of non-regulatory food safety management schemes. Please select up to five important areas in which your firm has encountered challenges.

- ☐ 1 Technical knowledge and skills of employees
- ☐ 1 Resistance to change by employees
- ☐ 1 Commitment to food safety by top management
- ☐ 1 Commitment to food safety by employees
- ☐ 1 The cost of development and implementation
- ☐ 1 The cost of training and education
- ☐ 1 Infrastructure
- ☐ 1 Increased paper work, record keeping and documentation
- ☐ 1 Rapid changes in government regulation
- ☐ 1 Government support
- ☐ 1 The access to adequate information





19. Listed below are a number of factors that could influence the effectiveness of the non-regulatory food safety management of food businesses. Based on the experience of your company, please rate factors according to how important you think they are for the implementation of non-regulatory food safety management schemes. **PLEASE TICK ONE BOX ON EACH LINE**

	Very important	Somewhat important	Slightly important	Unimportant
Top management commitment to food safety	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
Suitability of infrastructure and facilities	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
Human resource management including training, supervision and communication	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
Employee's attitude and commitment to food safety	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
The knowledge of the employee about food safety	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
The quality of the third-party audit	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
Other factors (please specify)	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4

**SECTION C. Costs**

20. In this question, we would like to get some idea of the implementation costs (one-time costs) and operating costs (recurring costs) of non-regulatory food safety management schemes.

Please rank each item below according to its proportion in the overall cost of implementation. For example, rank "1" for the largest cost item, rank "2" for the second largest cost item, and rank "3" for the third largest cost item. Rank "0" if a cost item has not been incurred. Please use the last column for notes if you have any estimates on the amount of time or actual costs.

	Rank	Notes
<b>Implementation costs</b>		
-Design and development		
-Training		
-Purchase of new facilities		
-Internal audit		
-External Audit fees		
-Other costs (please specify)		

Please rank each item below according to its proportion in the overall operating costs. For example, rank "1" for the largest cost item, rank "2" for the second largest cost item, and rank "3" for the third largest cost item. Rank "0" if a cost item has not been incurred. Please use the last column for notes if you have any estimates on the amount of time or actual costs.

	Rank	Notes
<b>Operating costs</b>		
-Sampling and testing		
-Record-keeping		
-Recurred training		
-External surveillance audit fees		
-Other costs (please specify)		

NOW YOU HAVE FINISHED THE PART I. IF THERE IS A RISK MANAGEMENT PROGRAMME (RMP) /FOOD SAFETY PROGRAMME (FSP) IN YOUR FIRM, PLEASE CONTINUE WITH THE QUESTIONNAIRE; IF NOT, PLEASE MOVE TO PART III ON PAGE 10.

**PART II RISK MANAGEMENT PROGRAMME/FOOD SAFETY PROGRAMME**

21. How did your company develop the RMP/FSP? Please tick one that best describes your firm's situation.

- ☐ <sub>1</sub> Developing systems in-house (own employees)
- ☐ <sub>2</sub> Hiring a consultant to develop systems
- ☐ <sub>3</sub> Jointly developing systems, while making use of both in-house employees and a consultant
- ☐ <sub>4</sub> Using the templates or models approved by the Ministry for Primary Industries

22. How long did it take to develop and implement your RMP/FSP before being registered by the Ministry for Primary Industries (MPI)? Please fill out all that are applicable.

	Time period
RMP	months
FSP	months

23. According to the requirements of the Ministry for Primary Industries (MPI), a RMP must be checked regularly by an MPI-recognized verifier and a FSP must be audited by an MPI-recognized auditor. How important is the external verification/audit for your enterprise in continuously improving its food safety management system?

Extremely important PLEASE CIRCLE ONE NUMBER  
Not at all important

1                      2                      3                      4                      5

24. Listed below are a number of areas in which food processing firms may encounter challenges during the implementation of a RMP/FSP. Please select up to five important areas in which your firm has encountered challenges.

- ☐ <sub>1</sub> Technical knowledge and skills of employees
- ☐ <sub>1</sub> Resistance to change by employees
- ☐ <sub>1</sub> Commitment to food safety by top management
- ☐ <sub>1</sub> Commitment to food safety by employees
- ☐ <sub>1</sub> The cost of development and implementation
- ☐ <sub>1</sub> The cost of training and education
- ☐ <sub>1</sub> Infrastructure
- ☐ <sub>1</sub> Increased paper work, record keeping and documentation
- ☐ <sub>1</sub> Government support
- ☐ <sub>1</sub> The access to adequate information



## PART III FOOD SAFETY CULTURE

25. Listed below are several statements about **leadership**. Please rate each statement according to the degree of agreement or disagreement based on the situation of your company.

PLEASE TICK ONE BOX ON EACH LINE

	Strongly Agree	Agree	Disagree	Strongly disagree	Don't Know
Food safety is a very high priority for leadership.	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 0
Food safety is a foundational value of the company.	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 0
Top management are involved in management reviews of the food safety management system.	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 0
It is a moral obligation to ensure food safety and preventing foodborne illness.	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 0
The leaders walk the talk to demonstrate their commitment to food safety.	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 0
Managers always put food safety ahead of production.	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 0

26. Listed below are several statements about **sharing of knowledge and information**. Please rate each statement according to the degree of agreement or disagreement based on the situation of your company.

PLEASE TICK ONE BOX ON EACH LINE

	Strongly Agree	Agree	Disagree	Strongly disagree	Don't Know
New employees will be trained on food safety before starting to work.	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 0
All employees really understand the ways in which food can be contaminated.	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 0
Employees fully understand how your company measures food safety performance.	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 0
The responsibilities of employees in different rank to ensure food safety are clearly defined and communicated.	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 0
Knowledge and information on food safety is shared and communicated throughout the whole company via a variety of messages and media.	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 0

27. Listed below are several statements about **employee involvement**. Please rate each statement according to the degree of agreement or disagreement based on the situation of your company.

PLEASE TICK ONE BOX ON EACH LINE

	Strongly Agree	Agree	Disagree	Strongly disagree	Don't Know
Employees always follow food safety management practices and procedures.	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 0
The documents of food safety management systems are regularly reviewed with employees.	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 0
Employees are encouraged to tell their co-workers when they are doing something that could cause a food safety issue.	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 0
Employees are encouraged or even rewarded for suggestions that will improve food safety.	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 0
Decisions, behaviours and operational practice do not change when internal or external audits are carried out.	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 0
Employees' contribution to assuring food safety is recognized.	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 0
All employees are confident in eating or recommending the products of your company.	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 0

#### PART IV OTHER INFORMATION

28. What sub-sector of the food industry is your company in? **Please tick all that apply.**

- |   |  |
|---|--|
| <input type="checkbox"/> 1 Bakery Product Manufacturing | <input type="checkbox"/> 1 Fruit and Vegetable Processing      |
| <input type="checkbox"/> 1 Beverage Manufacturing       | <input type="checkbox"/> 1 Meat and Meat Product Manufacturing |
| <input type="checkbox"/> 1 Cereal Product Manufacturing | <input type="checkbox"/> 1 Seafood Processing                  |
| <input type="checkbox"/> 1 Dairy Product Manufacturing  | <input type="checkbox"/> 1 Other Food Product Manufacturing    |

29. How many employees are currently in your company?

- |                                    |                                    |                                     |                                  |                                   |
|------------------------------------|------------------------------------|-------------------------------------|----------------------------------|-----------------------------------|
| <input type="checkbox"/> 1 1-5     | <input type="checkbox"/> 1 6-10    | <input type="checkbox"/> 1 11-20    | <input type="checkbox"/> 1 21-50 | <input type="checkbox"/> 1 51-100 |
| <input type="checkbox"/> 1 101-250 | <input type="checkbox"/> 1 251-500 | <input type="checkbox"/> 1 501-1000 | <input type="checkbox"/> 1 1001+ |                                   |

30. What is the business type of your firm?

- |  |   |
|--|---|
| <input type="checkbox"/> <sub>1</sub> Individual Proprietorship                        | <input type="checkbox"/> <sub>1</sub> Partnership                                 |
| <input type="checkbox"/> <sub>1</sub> Registered Limited Liability Company (non Co-op) | <input type="checkbox"/> <sub>1</sub> Co-operative Company                        |
| <input type="checkbox"/> <sub>1</sub> Joint Ventures and Consortia                     | <input type="checkbox"/> <sub>1</sub> Branches of Companies Incorporated Overseas |
| <input type="checkbox"/> <sub>1</sub> Government Owned Entity                          |   |

31. Does your company supply an overseas market?

- ☐ <sub>1</sub> Yes      ☐ <sub>2</sub> No

If yes, please give an estimate of your company's current market. (% of overall sales of your company)

Overseas markets  % :

Australian market  % EU market  % US market  %

Asian market  % Others  %

32. Would you like to participate further in this research? It will involve about a 30-minute interview by telephone to get more detailed information of your experience with non-regulatory food safety management.

- ☐ Yes → PLEASE FILL IN ALL THE INFORMATION OF Q33 (INCLUDING ITEMS WITH \*)
- ☐ No → PLEASE JUST FILL IN YOUR POSITION IN Q33

33. Details of the person completing this questionnaire. Items with \* are optional. All the information you supply is completely confidential.

Name*	
Position	
Company*	
Phone*	
Email*	

[illegible]

**Thank you very much for completing this questionnaire! Please return your questionnaire in the FreePost envelope provided, to:**

Encheng Chen  
Institute of Food Nutrition and Human Health  
Massey University  
Private Bag 11 222  
Palmerston North 4442

## Appendix C Cover letter and questionnaire for third-party certification bodies

### C.1 Survey cover letter



August 2012

Dear Sir/Madam,

I am writing to invite your organization to participate in a study on non-regulatory food safety management in the food industry. I am Encheng Chen, a PhD student in the Institute of Food, Nutrition and Human Health, Massey University. **My PhD Study is supported by the New Zealand China Food Safety Scholarship provided by the New Zealand Ministry of Foreign Affairs and Trade, and is supervised by Associate Professor Steve Flint, Dr Paul Perry, Dr Martin Perry and Dr Robert Lau.**

This survey is a key part of the research for my PhD thesis. The purpose of this survey is to explore the implementation of non-regulatory food safety management schemes in the food industry in New Zealand. The findings of the survey will help to **provide insights into implications for pragmatic programme design and government policy which can encourage all stakeholders to contribute to the food safety management.** Non-regulatory food safety management schemes are those programs developed to encourage food businesses to enforce their food safety management voluntarily over and above the mandatory food safety requirements set by government. Examples of such schemes are HACCP, ISO 22000 Food Safety Management System (FSMS), and schemes developed by individual retailers or manufacturers, such as Woolworths and Tesco.

Third-party conformity assessment bodies (CABs) have played an important role in the verification of the non-regulatory food safety management schemes through their business of certification and supply chain audits. The information being collected is important for understanding your experiences with non-regulatory food safety management. **Your participation is completely voluntary; however, your views are very important for this study.** The survey should be filled out by **the audit/certification service manager.** If you are not the audit/certification manager, please forward this survey to the correct person.

The survey is short, and it should not take more than 20 minutes to complete. **Please be assured that all of the information you provide will remain completely confidential.** No individual information will be made available to other parties or published. You can decline to answer any particular question. Completion and return of the questionnaire implies consent.

If your CAB does not offer food safety auditing services, I would be most grateful for a reply indicating as such in Q1.

This project has been evaluated by peer review and judged to be low risk. Consequently, it has not been reviewed by one of the University's Human Ethics Committees. The researcher(s) named above are responsible for the ethical conduct of this research. If you have any concerns about the conduct of this research that you wish to raise with someone other than the researcher(s), please contact Professor John O'Neill, Director, Research Ethics, telephone 06 350 5249, email: [humanethics@massey.ac.nz](mailto:humanethics@massey.ac.nz).

If you have any questions or concerns about the questionnaire or how to fill it out, please feel free to contact me at the address, phone number or email listed below.

Thank you for your time and participation in this survey.

Yours sincerely,

Encheng Chen  
PhD student  
Institute of Food Nutrition and Human  
Health, Massey University  
Tel: (06) 356-9099 extn.81409  
Mob: (021) 136-9090  
Email: [e.chen1@massey.ac.nz](mailto:e.chen1@massey.ac.nz)

Steve Flint  
Associate Professor  
Director (Food Science and Technology)  
Institute of Food Nutrition and Human  
Health, Massey University  
Tel: (06) 356 9099 extn. 81418  
Email: [s.h.flint@massey.ac.nz](mailto:s.h.flint@massey.ac.nz)



## C.2 Survey questionnaire



**CONFIDENTIAL**

ID: \_\_\_\_\_



## NON-REGULATORY FOOD SAFETY MANAGEMENT IN NEW ZEALAND

The Institute of Food, Nutrition and Human Health (IFNHH)  
Massey University

## How to fill out this questionnaire

To answer these questions all you have to do is tick (✓) a box, circle a number or write in the space provided. After certain questions, there is a brief introduction in **bold type** explaining what to do.

You can choose to fill out this hard copy questionnaire or finish the survey online by connecting to the following link. If you want the electronic edition of the link, please feel free to email me at the address listed below.

[http://masseybusiness.eu.qualtrics.com/SE/?SID=SV\\_5auT4D4J2zPxeVC](http://masseybusiness.eu.qualtrics.com/SE/?SID=SV_5auT4D4J2zPxeVC)  
or <http://goo.gl/ERDYO>

The questionnaire asks you about a variety of subjects on non-regulatory food safety management such as effectiveness, credibility, and audit quality.

There are 22 questions in this survey. Some questions may require special knowledge. **The survey should be filled out by the audit/certification service manager.**

Your participation is completely voluntary, but we are very grateful for your help. **All the information collected is completely confidential.**

## Returning the questionnaire

If you finish this survey online, the questionnaire will be send back to us automatically. Otherwise, when you have filled out the hard copy questionnaire, please post it back in the FreePost envelope as soon as possible.

Thank you very much for your help.

Encheng Chen  
Institute of Food, Nutrition and Human Health  
Massey University  
Palmerston North  
Tel: (06) 356-9099 extn.81409  
Mob: (021) 136-9090  
Email: [e.chen1@massey.ac.nz](mailto:e.chen1@massey.ac.nz)

SURVEY OF NON-REGULATORY FOOD SAFETY MANAGEMENT

1. What kinds of accredited non-regulatory food safety audit services can your CAB provide in New Zealand? **Please tick all that apply.**

- |   |   |
|---|---|
| <input type="checkbox"/> <sub>1</sub> Hazard Analysis and Critical Control Point (HACCP)  | <input type="checkbox"/> <sub>1</sub> ISO 22000 Food Safety Management System (FSMS)                  |
| <input type="checkbox"/> <sub>1</sub> Food Safety System Certification (FSSC) 22000   | <input type="checkbox"/> <sub>1</sub> British Retail Consortium (BRC) Global Standard for Food Safety |
| <input type="checkbox"/> <sub>1</sub> Safe Quality Food (SQF) Program   | <input type="checkbox"/> <sub>1</sub> International Featured Standards Food (IFS Food)                |
| <input type="checkbox"/> <sub>1</sub> GLOBALG.A.P (GGAP, GAP refers to good agriculture practice)   | <input type="checkbox"/> <sub>1</sub> New Zealand GAP (NZGAP)   |
| <input type="checkbox"/> <sub>1</sub> Others (please specify):<br><div style="border: 1px solid black; height: 20px; width: 550px; margin-top: 5px;"></div> |   |
| <input type="checkbox"/> <sub>1</sub> None – Not involved in food safety standards auditing   |   |

2. Does your CAB offer any non-accredited non-regulatory food safety audit services?

☐ <sub>1</sub> Yes, please list:

☐ <sub>2</sub> No



3. I would like to get an idea of the year when your CAB started offering each scheme and the current number of certificates issued by your CAB.

Please fill in the name of the non-regulatory food safety management schemes (e.g. HACCP, BRC) in the first column (some have been input in advance), fill in the year when your CAB started offering each scheme in the second column, and fill in the current number of certificates in the last column.

Name of non-regulatory schemes	The year starting offering service	Current number of certificates
BRC Global standard for Food Safety		
HACCP		
ISO 22000		
FSSC 22000		
SQF		
IFS Food		
GGAP		
NZGAP		
Others (please specify)		

4. Listed below are four broad kinds of non-regulatory food safety schemes developed by different kinds of organisations.

Please rank the four broad types in terms of how effective you think each is in helping to ensure food safety, from the most effective (1), to the least effective (4).

Private schemes, e.g. 2nd party schemes such as WQA	<input type="checkbox"/>
Public schemes by industry sector e.g. BRC, SQF, IFS, GGAP, FSSC	<input type="checkbox"/>
Public international standard schemes, e.g. ISO 22000	<input type="checkbox"/>
Private (or public) non-accredited schemes, e.g. 2nd party or CAB owned schemes	<input type="checkbox"/>

5. In general, how much confidence do you have in the standard setting process found in different kinds of organizations?

PLEASE TICK ONE BOX ON EACH LINE

	Very high confidence	High confidence	Some confidence	Low confidence	Very low confidence
Individual firms, e.g. retailer, food business, CAB	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
Government agencies	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
NGOs, e.g. industry associations	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
International agencies	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5

6. How do you expect the non-regulatory food safety schemes developed by different kinds of organizations to change, if at all, over the next 5-10 years?

PLEASE TICK ONE BOX ON EACH LINE

	More stringent	No change	Less stringent
Private schemes, e.g. 2nd party schemes such as WQA	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3
Public schemes developed by industry sector, e.g. BRC, SQF, IFS, GGAP, FSSC	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3
Public international standard schemes, e.g. ISO 22000	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3
Private (or public) non-accredited schemes, e.g. 2nd party or CAB owned schemes	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3

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7. Listed below are a number of benefits that are reported to result from implementing a recognised food safety management scheme. Please rate how frequently your customers report each benefit eventuating on a 4-point scale.

PLEASE TICK ONE BOX ON EACH LINE

	Always <input type="checkbox"/> 1	Often <input type="checkbox"/> 2	Seldom <input type="checkbox"/> 3	Never <input type="checkbox"/> 4
Reduction in product recalls	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
Reduction in incidences of foodborne illness	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
Increased productivity	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
Improved human resource efficiency	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
Reduced production cost	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
Increased product prices	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
Recognition by industry	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
Improved reputation	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
Increased ability to maintain existing market share	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
Increased market share	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
Increased ability to access new markets	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
Meeting government requirements in a cost-effective way	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
Other benefits (please specify)	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4

8. Listed below are a number of factors that could influence the effectiveness of the non-regulatory food safety management of food businesses. Please rate each factor on a 4-point scale according to how important you think it is to the effectiveness of a non-regulatory food safety management scheme in ensuring food safety.

PLEASE TICK ONE BOX ON EACH LINE

	Very important <input type="checkbox"/> 1	Somewhat important <input type="checkbox"/> 2	Slightly important <input type="checkbox"/> 3	Unimportant <input type="checkbox"/> 4
Top management commitment to food safety	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
Suitability of infrastructure and facilities	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
Human resource management including training, supervision and communication	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
Employee's attitude and commitment to food safety	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
The knowledge of the employee about food safety	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
The quality of the third-party audit	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
Other factors (please specify)	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4
	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4

9. CABs are required to be independent and objective. How important are national or international accreditation bodies in ensuring that CAB's are independent and objective in practice?

PLEASE CIRCLE ONE NUMBER

Extremely important Not at all important

1 2 3 4 5

10. How important is it for CABs to demonstrate to their independence and objectivity to stakeholders through accreditation?

PLEASE CIRCLE ONE NUMBER

Extremely important Not at all important

1 2 3 4 5

11. Does increasing competition among CABs positively or negatively affect the objectivity and neutrality of the certification process?

☐<sub>1</sub> Positively ☐<sub>2</sub> Not at all ☐<sub>3</sub> Negatively

Would you please briefly explain your answer?

12. How do you think the following measures would affect the quality of third-party audits?

PLEASE TICK ONE BOX ON EACH LINE

	Improve	No change	Worsen
Extending the liability of CABs	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>
Naming and shaming the failed CABs by the scheme owner	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>
Increasing the requirements of auditors	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>
Reducing audit costs, e.g. by reducing audit time	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>
Improving audit technology or more use of technology in the audit process	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>
Adopting the risk oriented auditing practice instead of carrying out the audit schematically	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>
Signing a long contract with a food company	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>
Others (please specify):	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>
	<input type="checkbox"/> <sub>1</sub>	<input type="checkbox"/> <sub>2</sub>	<input type="checkbox"/> <sub>3</sub>

SURVEY OF NON-REGULATORY FOOD SAFETY MANAGEMENT

13. How important is it to a reliable audit outcome for the auditors to have a good technical knowledge of the industry or product?

**Extremely important** **PLEASE CIRCLE ONE NUMBER**  
**Not at all important**  
 1                      2                      3                      4                      5

14. How important is it to a reliable audit outcome for the auditors to have good audit practice skills?

**Extremely important** **PLEASE CIRCLE ONE NUMBER**  
**Not at all important**  
 1                      2                      3                      4                      5

15. Is technical knowledge more or less important than audit skills to a reliable audit outcome for the auditors?

☐ <sub>1</sub> More                      ☐ <sub>2</sub> Equal                      ☐ <sub>3</sub> Less

16. On average, what percentage of customers of your CAB do not complete the certification process?

Average percentage:  %

17. How many food companies have had their certification to a food safety management scheme suspended or withdrawn last year?

The number of food companies:

18. Could you please list the most typical kinds of non-compliance issues your CAB encounters in food businesses during non-regulatory food safety audits? I would like to get a general sense at this stage, and will explore this in more detail if you are willing to do follow up an interview (as indicated in Q21).

For schemes based on QMS&HACCP (e.g. BRC, FSSC 22000, SQF 2000, ISO 22000)	
For schemes based on good practice (e.g. GLOBALG.A.P., NZGAP)	

19. Do you think that the government should regulate the third-party auditing activities of the non-regulatory food safety management schemes in New Zealand?

☐<sub>1</sub> Yes      ☐<sub>2</sub> No      ☐<sub>0</sub> Don't know

Please briefly explain your reason(s):

20. A new law, replacing the Food Act 1981, is before Parliament. If passed into law, the **Food Bill** would replace the Food Act 1981 and introduce some fundamental changes to New Zealand's domestic food regulatory regime, e.g. a risk-based approach to food safety. If the proposed Food Bill is passed into law, how do you expect that food businesses will change their implementation of non-regulatory food safety management schemes in New Zealand?

☐<sub>1</sub> Fewer food businesses will implement these kind of schemes  
☐<sub>2</sub> Expect no change  
☐<sub>3</sub> More food businesses will implement these kind of schemes

21. Would you like to participate further in this research? It will involve about a 30-minute interview by telephone to get more detailed information of your experience with non-regulatory food safety management.

☐ Yes → PLEASE FILL IN ALL THE INFORMATION OF Q22 (INCLUDING ITEMS WITH \*)  
☐ No → PLEASE JUST FILL IN YOUR POSITION IN Q22

22. Details of the person completing this questionnaire. Items with \* are optional. **All the information you supply is completely confidential.**

Name*	
Position	
Company*	
Phone*	
Email*	



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## **Appendix D Interview question list**

### **D.1 Motivation**

Does your company have food safety liability insurance/product liability insurance?

If yes, does the insurance company require your company to have certain food safety management system in place? Is FSP or RMP enough?

If there is no customer request, how likely will the director or owner of your company withdraw or abandon the non-regulatory certification such as WQA and BRC?

### **D.2 Attitude to third-party certification bodies**

Would you prefer being inspected by each customer or by a single third-party body?

A combined audit can reduce the external audit fees. Does your external audit service provider offer a combined audit to your company?

Are there food safety or quality issues that external audits have failed to identify but you know you have to address after the auditors have left?

### **D.3 Challenge during the implementation and way to overcome**

Increased paper work, record keeping and documentation are major challenges for food companies when implementing non-regulatory food safety management schemes.

How does your company deal with this issue?

How does your company deal with compliance to multiple standards/schemes?



#### **D.4 Changes after the implementation**

On average, how many times does your company have to be audited by customers every year?

Do your customers contract to third-party bodies to conduct the audit?

Once your company passes one of non-regulatory food safety audit, is it going to be easier to pass other customers' audits?

Do you think non-regulatory food safety management can strengthen the food safety culture in your company?

#### **D.5 Food safety culture**

Would you please summarise how your company manages food safety and ensures the safety of your products?

If a food safety issue happens, how will you communicate the issue to senior management to gain their support of corrective actions?