

# Consumers' perceptions of food risk management quality: Chinese and Korean evaluations

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**Abstract:** Risks, including food risks, are found to be different between the perceptions of 'experts' and consumers, thus understanding the potential difference in the perceptions of the effective food risk management (FRM) between consumers and experts is important in developing effective FRM strategies. This information enables policy makers to integrate societal concerns and values into risk management and communication regarding food safety and to enhance the public confidence in the authorities' approach to the food safety management. The purpose of this study is to understand how consumers evaluate the quality of the food risk management practices that are performed by the government and to determine the underlying psychological factors influencing consumer evaluations of food risk management quality (FRMQ). A comparative survey study was conducted in China and Korea, and the measurement scales used in the structural model were found to be configurally and metrically invariant between these two countries. The results show the difference in the perception of Chinese and Korean consumers regarding their evaluation for the FRMQ. While the perceived expertise of food risk managers was found to be the most important determinant in China, the proactive consumer protection was found to be the most important one in Korea. The scepticism in risk assessment and the communication practice was found to be second most important factor both in China and Korea. These results shed lights at the future policy recommendations.

**Key words:** food risk management, consumer evaluation, food safety

The consumer and market demands are critical to the outcome of agricultural, trade, health and nutrition related policies. Over the last 20 years, the issues surrounding food and health have received an increasing public attention, in the policy, consumer and media arenas (Kramer 1990; Sparks and Shepherd 1994; Hughes 1995; Kafka and von Alvensleben 1998; Micklitz 2000; Meijboom et al. 2006; Worosz et al. 2008). One of the major drivers of the public policy interest in this area is an increase in the consumer's concern that is attributable to health and safety related causes. Food safety emerges as an important issue in the society with an increased media attention (Frewer et al. 2002); consumer studies (Miles et al. 2004), and the establishment of new regulatory bodies. Food safety has become one of the most important issues of the public concern worldwide, as various types of food safety related incidents reduced the consumer confidence in the healthiness of food products in recent years. Some studies report that the consumers are more concerned than ever by the food safety risks (World Health Organization 2002).

The occurrence of cross-national food safety crises and the uncertainty associated with food quality and

safety have heightened the consumers' awareness of food quality and safety and changed their beliefs, attitudes and behaviour towards the food safety issues. Safety is one of the food product attributes that are used by the consumers in their evaluation of food choices (Grunert 2005); which can be classified as the risk information that aims at reducing the consumers' uncertainty when making purchasing decision (Verbeke 2005).

Consumers are becoming increasingly sceptical and concerned about the quality and safety of food, and appear to want information to help their choice. However, there have been evident failures in the provision of information regarding food safety, and the public distrust towards the current food safety risk management is reported to have increased substantially. These concerns have contributed to changes in the governing principles that guide the practice of the food risks management (FRM) and to changes in the institutional arrangement for food safety in Europe (Houghton et al. 2006) and beyond (Yasui 2004). The 'crisis of trust' in science and risk regulation on the part of the public has led to a drive for a greater openness and transparency in policy making,

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and other policy recommendations for increasing the public trust (Rowe and Frewer 2000; Byrne 2002; Wall et al. 2004).

Current failures of risk information to achieve its goals may stem from the gaps in understanding the relationship between the individual perceptions, information processing and behaviour (Langford et al. 1999). Various studies have found that public perceptions of risks, including food risks, differ from the perceptions of 'experts' (Douglas and Wildavsky 1982; Slovic 1987; Fischler 1998). Some studies argued that the public tends to 'misjudge' the relative food risks at least when compared with the expert opinions (Lazo et al. 2000; Hansen et al. 2003). These studies reported that the experts tend to believe in the rationality of arguments, facts, and science, arguing that science in itself provides an adequate strategy to control risks, while the consumers tend to use factors such as the distrust in social actors, the credibility of risk regulators and the perceived controllability of risks in assessing risks (Figure 1) (De Boer et al. 2005; Van Kleef et al. 2007). Understanding potential differences in perceptions of the effective FRM between consumers and experts is important for designing the appropriate FRM strategies, as a failure to integrate societal concerns and values into the risk analysis procedures is one of the factors associated with the decline in the public confidence in the risk assessment and risk management (Renn and Rohrman 2000; Frewer et al. 2005).

There has been a growing interest, not only in the role and mechanisms of information but also in the evaluation of the various techniques and vehicles for spreading the information related to food products (Verbeke 2005). More information does not necessarily mean better informed consumers (Dranove et al. 2003; de Garidel-Thoron 2005), and the information is likely to be effective only when it addresses specific information needs, and can be processed and used

by its target audience (Verbeke 2005). This suggests that it is necessary to understand and identify the target audience's needs and to manage the information provision in order to optimally address particular needs of consumers. Knowing the consumer and understanding his/her behaviour offers information about his/her decision making, which may be a guideline for the development and implementation of the effective policy and marketing programs in the food supply chain (Serences and Rajcaniova 2007). However, there have been limited empirical studies of the factors influencing the public perceptions of what constitutes the best practice in risk management (Houghton et al. in press). The purpose of this paper is to understand how consumers evaluate the quality of the food risk management practices that are performed by the government and to determine the underlying psychological factors influencing the consumer evaluations of the food risk management quality (FRMQ).

## METHOD

### Survey design and scale development

Frewer and colleagues (Houghton et al. 2006; Van Kleef et al. 2007) have conducted a survey study in 2005–2006 which was commissioned by the European Commission under the SAFE FOODS project which aimed to promote food safety through a new integrated risk analysis approach for foods. Their study assessed twenty five EU member countries and assessed their consumers' perception of the FRMQ and modelled the factors that drive consumer evaluations of the FRM practices and their relative importance with 2533 respondents. This study adopted the measures and the survey study approach that was used in the EU project.

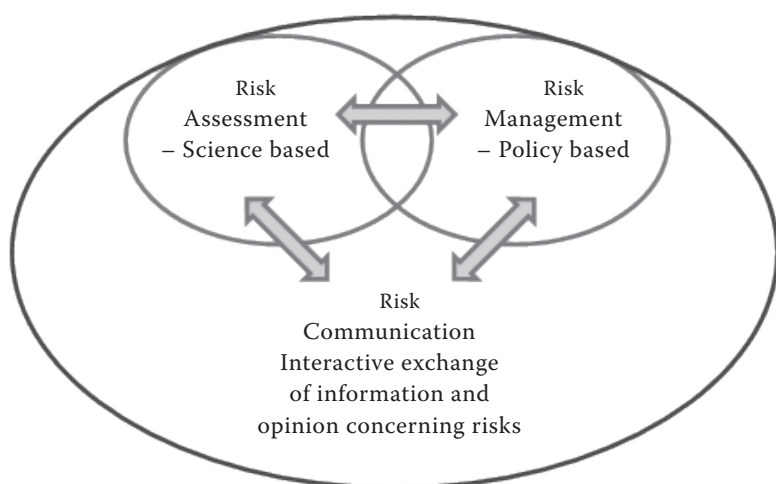


Figure 1. Risk analysis framework

It has been claimed that when consumers deal with extremely complex objects that have simultaneous linkages with many logical factors and sets, their evaluations may be strongly affected by various extraneous concerns and cues (Campbell et al. 1976; Pardo et al. 1993). Food safety can be categorized as one of these objects that have complex multiple linkages between the issues of environmental protection, socioeconomic benefits, trade and political aspects. Consequently, the consumer choices regarding food safety are likely to be a complex process that may be influenced by multiple factors. The multi-attribute model (Fishbein and Ajzen 1975) may be an appropriate model to frame such a complex process of consumer behaviour as it has been well recognized as an established framework for explaining the attitude, intention, and choice, and it has been widely used in the consumer research for its diagnostic value in explicating attitudes (Mittal and Lee 1988; Sheppard et al. 1988; Peterson and Wilson 1992; Agarwal and Malhotra 2005).

The conceptual model of this study was developed specifically to address the critical role of consumers' cognitive constructs in determining their evaluation process of the FRMQ (Figure 2). Our research model includes five constructs (Table 1):

*Proactive consumer protection (PCP)*; *Opaque and reactive risk management (ORR)*; *Scepticism in risk assessment and communication practices (SCEP)*;

*Honesty of food risk managers (TRUSTH)*; and *Expertise of food risk managers (TRUSTE)*.

These constructs were developed by the Frewer research with an exploratory qualitative focus group study in their EU project.

*Proactive consumer protection (PCP)* is defined as the management systems that the consumers perceive to be functioning with respect to food safety (Van Kleef et al. 2007). This construct aims to measure the consumer's perception regarding: the existence of the food risk management system; the efficiency in handling food safety problems; the extent of efforts made by the authorities for preventing food risks; and the effective enforcement of food safety laws by the authorities.

*Opaque and reactive risk management (ORR)* captures the concepts of responsiveness to food safety problems. This construct depicts negative aspects of the consumers' perception regarding the inadequacy of the FRM system, the insufficiency and lack of transparency in the authorities' effort to respond to the consumer's concern.

*Scepticism about risk assessment and risk communication (SCEP)* encapsulates the consumers' scepticism regarding how food risks are assessed and communicated by the authorities and the scientists.

*Honesty of food risk managers (TRUSTH)* measures negative perception of consumers toward food risk

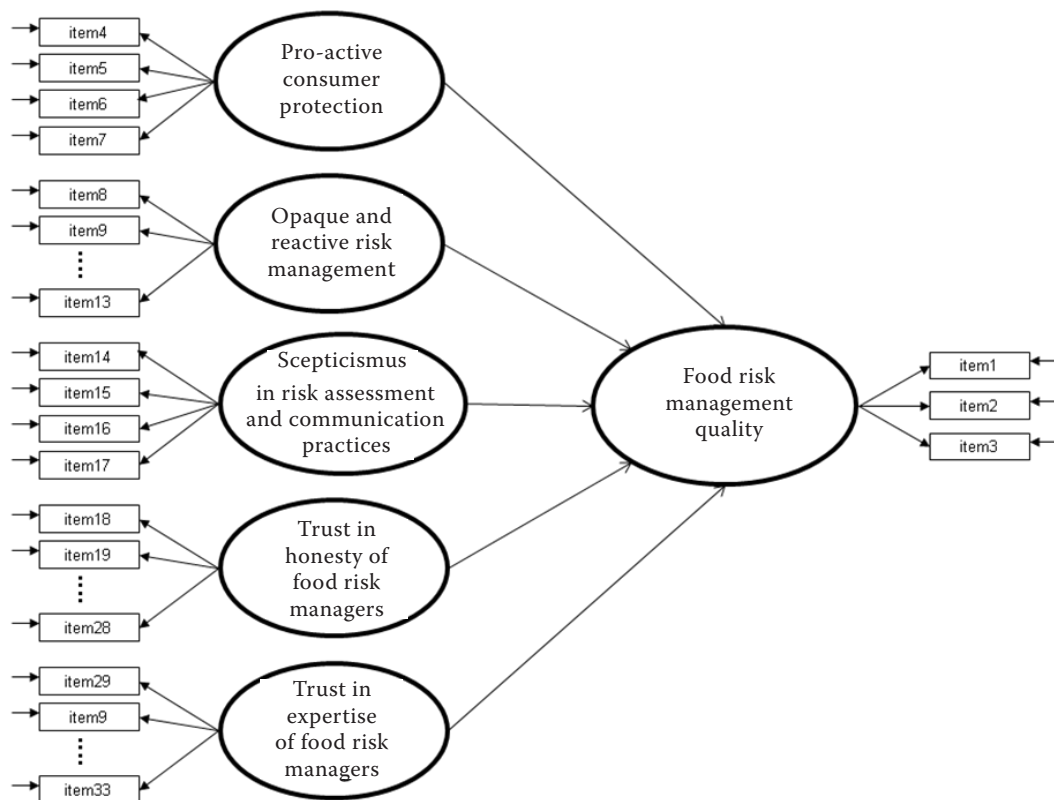


Figure 2. Structural Model for Food Risk Management Quality (FRMQ) evaluation

Table 1. Definition of six constructs of FRMQ model

Variables	Definition	Previous studies
Proactive consumer protection (PCP)	The management systems that consumers perceive to be functioning with respect to food safety – consumer's perceptions of whether there is an established system for controlling food risks – the rapidity of responses to food safety problems – efforts made to prevent food risks occurrence The efficient enforcement of food safety laws	Van Kleef et al. (2007), Van Trijp (Frewer and Van Trijp 2007)
Opaque and reactive risk management (ORR)	Captures the concepts of responsiveness to food safety problems – negative measures taken or lack of management actions taken in food safety	Honghton (Van Kleef et al. 2007)
Scepticism in risk assessment and communication practices (SCEP)	Capture consumers' doubts about food safety assessment and the uncertainties surrounding this	Krystallis (Krystallis et al. 2007)
Trust in honesty of food risk managers (TRUSTH)	The degree to which an audience perceives the assertion made by a communicator to be ones that the speaker considers valid	Hovland et al. (1953)
Trust in expertise of food risk managers (TRUSTE)	The extent to which a food risk manager is perceived to be capable of making correct assertions	Hovland et al. (1953)
Food Risk Management Quality (FRMQ)	Consumers' evaluation of the regulatory system to manage food hazards	Van Kleef et al. (2007), Van Trijp, (Frewer and Van Trijp 2007)

managers. This construct reflects consumers' opinion of whether food risk managers are biased, insincere and dishonest in handling food risk information and in communicating with the public regarding food risks. *Expertise of food risk managers (TRUSTE)* is a positive construct that illustrates consumers' perception about food risk managers in terms of their expertise, accountability, knowledge and authority.

*Food risk management quality (FRMQ)* is the dependent construct which explains the consumers' evaluation of the regulatory system in place to manage food hazards: "food risks are very well managed in our country," "when I buy food, I am certain that it is safe to eat," and "I trust the regulatory system to protect me from food risks" (Van Kleef et al. 2007). All items were measured on 5 point Likert scale with 1 = strongly disagree and 5 = strongly agree.

### Survey data collection

The data were collected from China and Korea in 2009, and 640 questionnaires were distributed and returned in five districts: 320 sample from Korea and 320 sample from China. After the consultation with industry experts, these five districts were chosen based on the market research goals and the availability of respondents. Many studies used student samples for the empirical analysis and the validity and generalizability of the student samples have been questioned as the student population does not

represent the general population or the "real people" (Yoo et al. 2000).

### DATA ANALYSIS

To explore whether the hypothesized model fits the survey data, the Structural Equation Modelling (SEM) was employed. The SEM is a multivariate statistical modelling technique that is becoming more widely used in behavioural science, as it can model complex processes with multiple factors. The SEM is primarily developed to examine the structure of relationships between the independent latent variables and the dependent latent variables (Diamantopoulos and Siguaw 2000).

The SEM analysis is divided into two parts: (1) a structural model and (2) a measurement model. The structural model deals with the relationship between constructs (i.e. latent independent variables) and the latent dependent variable, and this is the main relationship of interest in the model (Figure 2). The measurement model deals with the relationship between the observed variables and latent independent variables (Table 1, Figure 2).

### Reliability analysis

The selected observed variables were initially examined and verified to have a normal distribution. The

Table 2. Number of items and coefficients of reliability for the six final scales

Variables	Items	Cronbach's $\alpha$
Proactive consumer protection (PCP)	4	0.773
Opaque and reactive risk Management (ORR)	6	0.607
Scepticism in risk assessment and communication practices (SCEP)	4	0.735
Trust I honesty of food risk Managers(TRUSTH)	11	0.800
Trust in expertise of food risk Managers(TRUSTE)	5	0.609
Food risk management quality (FRMQ)	3	0.750

skewness and kurtosis of the statistical distribution of the original eighteen observed variables were tested in order to screen out those with non-normality. All measures were assessed with the exploratory factor analysis and the reliability test (i.e. Cronbach's Alpha) using the data collected in the study. The final items used to measure the FRMQ model are presented in Table 1. The coefficients of Cronbach's alpha areas a measure of the squared correlation between the observed scores and the true scores, showing how well a set of factors (or items) measure a single latent construct. The tested scales showed a reasonable to good reliability, ranging from 0.61 to 0.80 (Tables 2 and 3).

### Cross-national validity of measurement model

The empirical model (i.e. path diagram) based on *priori hypotheses* were formulated using the AMOS 5 software and estimated using a maximum likelihood function. A comprehensive structural model was estimated which included the aforementioned six constructs. Prior to the interpretation of the path coefficient of this model, the measurement equivalence was checked. Equality of the factor structure and loading is necessary to make comparisons between countries and ensures that the scales can be interpreted in

the same way in these two countries (Anderson and Gerbing 1988; Steenkamp and Baumgartner 1998).

The measurement equivalence was tested in three steps: *configural*, *metric*, and *scale invariance* as shown in Table 4. The CFI, IFI and RMSEA indices have been found to be most robust in assessing the measurement equivalence in the previous studies (Shook et al. 2004). In this study, the CFI and RMSEA indices were used to assess if the actor loading are invariant across group (*metric invariance*); and if the intercepts of variables for corresponding items across groups are invariant (*scalar invariance*); and if the dimensions of constructs are equivalent across the groups (*configural invariance*) (Steenkamp and Baumgartner 1998).

The results show that the *configural invariance* was supported as the CFI and RMSEA values reflect good fit to the data (CFI = 0.92, RMSEA = 0.04). This suggests that the patterns of factor loadings for both Korea and China were found to be equivalent, showing the existence of similar latent constructs between these two groups.

*Metric invariance* was also supported with the value of CFI = 0.90 and RMSEA = 0.04, implying that the way in which the items in the questionnaire relate to underlying constructs is the same across countries. This permits a meaningful comparison of the difference scores on the items across countries (O'Sullivan

Table 3. Correlation coefficients for the six final scales

Construct	Protection	Opaque	Scepticism	Honesty	Expertise	FSRMQ
Protection	1					
Opaque	-0.250(**)	1				
Scepticism	0.106(**)	0.421	1			
Honesty	0.250	0.607	0.212	1		
Expertise	0.105	0.382	0.753	0.283	1	
FSRNQ	0.351	-0.227	-0.167(**)	-0.212	0.101(*)	1

CMIN/DF = 1.910; GFI = 0.947; RMR = 0.045; CFI = 0.948; IFI = 0.949; TLI = 0.937; RMSEA = 0.039; \*\*\* $P < 0.001$ ; \*\* $P < 0.05$ ; \* $P < 0.10$



Table 4. Goodness of fit statistics

	CMIN(DF)	NFI	IFI	CFI	TLI	RMSEA
Configural invariance	761.030 (438)	0.825	0.917	0.916	0.903	0.035
Metric invariance	836.653 (453)	0.807	0.901	0.900	0.888	0.038
Scalar invariance	836.673 (454)	0.807	0.902	0.900	0.889	0.038

et al. 2005). The scores on *scalar invariance* indices (CFI = 0.90 and RMSEA = 0.04) also show that item intercepts were found to be invariant across countries, thus the means of the countries can be compared across the countries.

The overall fit statistics of the measurement model were as follows: the value of the RMSEA was 0.039; CMIN/DF (relative chi-square) = 1.910; GFI = 0.947; RMR = 0.045; CFI = 0.948; IFI = 0.949; TLI = 0.937. The RMSEA value of 0.039 indicates a good fit of our model, as values below 0.05 are suggested to be a close fit of the model to the data (Steenkamp and Baumgartner 1998). Comparative Fit Index (CFI) was 0.948 which is acceptable, and relative chi-square (CMIN/DF) of 1.910 reflects a good fit. These results indicate a reasonable fit of the variables in the model. This goodness of fit index pertaining to the empirical model is statistically significant.

## RESULTS AND DISCUSSION

The purpose of this paper was to assess the psychological framework of Chinese and Korean consumers in their evaluation of the current system of the Food Risk Management by modelling the FRMQ and to examine the difference between the Chinese and Korean consumers' perspectives. The SEM analysis shows that the consumer evaluations were different in these countries, suggesting that different factors

drive the perceptions of the FRMQ in China and Korea (Table 5). While the *Perceived expertise of food risk managers* (TRSTUE) was found to be the most important construct in the Chinese FRMQ evaluation, the *Proactive consumer protection* (PCP) was found to be the most important construct in the Korean FRMQ evaluation. The second most important construct was found to be identical in both Korean and Chinese consumers' FRMQ evaluation, which was the *Scepticism regarding RM* (SCEP). Chinese consumers were found to consider the *Perceived dishonesty of food risk managers* (TRUSTH) as the third most important construct, while Korean consumers were found to view the *Perceived expertise of food risk managers* (TRUSTE) as the third most important determinant in their evaluation.

The results showed that the trust in the *Perceived expertise of food risk managers* (TRUSTE) was an important predictor of the Chinese consumers' confidence in the FRMQ. This construct was found to be the third most important determinant in Korean case. The TRUSTE is related to food risk managers' competence and knowledge of the food safety management, which was considered to be a prerequisite for the successful food safety management (Van Kleef et al. 2007). Food safety is credence *good* that remains undetected even after consumption, and when food products contain significant credence attributes, consumers' expectations about forthcoming information and the expertise of the food risk managers are

Table 5. Standardized estimates of path coefficients of the FRMQ model for China and Korea

Construct	China		Korea	
	standardized estimates	t-value	standardized estimates	t-value
Proactive consumer protection (PCP)	-0.017	-0.157	0.588(***)	6.192
Opaque and reactive risk Management (ORR)	-0.081	-0.787	0.205	1.373
Scepticism in risk assessment & communication practices (SCEP)	-0.357(**)	-2.241	-0.470(***)	-4.744
Honesty of food risk managers (TRUSTH)	-0.204(**)	-2.351	-0.213(*)	1.660
Expertise of food risk managers (TRUSTE)	0.546(**)	3.067	0.399(***)	3.781

\*\*\* $P < 0.01$ , \*\* $P < 0.05$ , \* $P < 0.10$

important determinant of food demand. Consumers cannot directly measure food safety risks for themselves (i.e. credence goods), thus the food safety issues are a matter of trust (Kennedy 1988). Due to this nature, the role of the government and food risk managers as the active information providers and the regulators magnify, thus its reliability becomes critical (Kim 2008). The provision of information about how the expertise is organized and established for the food safety management to the public in a coherent and transparent way is important in China.

In China, the role of the government is particularly influential and prominent, given its political and industrial framework. The Chinese Government is concerned with food safety in Chinese agricultural sector and paying an increasing attention to food safety system (Zhang 2008). The Chinese government facilitates, endorses and regulates the entire food system and food producers have limited role in food safety regulation. There were too many small enterprises, many illegal, to monitor in China's food production and processing industry. For example, approximately 350 000 of China's 450 000 registered businesses in food production and processing industry employ as few as 10 people or less, thus posing a great challenge to the food safety management (Dellios et al. 2009). Thus, the public tends to heavily rely on the government in developing comprehensive strategies to build an efficient food safety management system. In response to the public's expectation toward government's role in the FRM, a draft food safety law was developed by the National People's Congress in China in October 2008. This newly revised law intended to improve the efficacy and transparency of the FRM practice by holding the food experts and the authorities responsible for what goes into processed food as well as for an attempt to disguise any negative outcomes (Dellios et al. 2009).

One striking finding was a distinctive difference between China and Korea regarding the *Proactive consumer protection* (PCP) construct. While the PCP was found to be the most important determinant of the Korean consumers' FRMQ evaluation, this construct came out to be insignificant in Chinese case. In other words, the PCP is a strong indicator of how consumers perceive the FRMQ, and the use of the proactive risk management strategies may be significantly critical in Korea. This may be due to Korean consumers' recent negative experience with a poorly handled reactive risk management by the Korean government in the process of the Korea-US (KORUS) free trade agreement (FTA) negotiation for beef import.

The Korean public expressed their heightened concerns for food safety and opposed to the US beef

import. They challenged the Korean government by having the first candlelight vigil on May 2, 2008, protesting in the central Seoul, which was followed by massive demonstrations, gathering over 100 000 citizens on the streets of Seoul. The KORUS FTA crisis shows that the mishandling of public concerns for the BSE (i.e. food safety) on the US beef import led to a breakdown of a relationship between the public and the government and the loss of confidence between the two (Kim 2008).

One of the factors that led to this public disarray was found out to be lack of effectiveness and timeliness of the government communication with the public regarding food safety. It took more than 40 days since the start of the crisis for the Korean government to take an affirmative action by sending a Korean delegation to the U.S. on June 20, 2008 to amend the conditions of the FTA beef import deal in order to defuse the crisis. The delay in the Korean government response to the public outcry resulted in a state of vulnerable trust. The Korean policy makers and agri-food regulators reacted to the outbreaks of the Korean public uproars for the U.S. beef trade in *ad hoc* approach by developing the food safety and risk management measures for ramification of the public uproars rather than prevention (Kim 2008). Adopting a responsive communication approach (i.e. informing consumers about what has been done to mitigate the risks after they have occurred) is unlikely to generate the consumer confidence in the risk management activities, and communication about the risk management practice should be strongly and coherently embedded in the risk analysis process (Van Kleef et al. 2007). The role of the 'precautionary principle' as a regulatory principle of food regulation should be emphasized (Vos 2000).

The *Scepticism in risk assessment and communication* (SCEP) was found out to be the second most important determinant both in the Korean and Chinese FRMQ evaluation. The consumers' scepticism in risk assessment and communication is also affected by the national or regional food safety incidents (Van Kleef et al. 2007). Both in China and Korea, there have been several food scares due to the safety issues which might have contributed to their heightened scepticism and loss of confidence in risk assessment and communication by the authorities. To rebuild and to ensure the consumer trust, the regulatory body may need to reinforce the trustworthiness of the food safety system by increasing transparency and traceability in the system (Meijboom et al. 2006). The government may obtain these terms by having appropriate and consistent enforcement of food safety laws through the prosecutorial system, and by clarifying the issue

of who is and/or ought to be accountable for how food is produced, processed, and distributed needs to be considered in developing and implementing such system (Kim 2008).

## CONCLUSIONS

Comparative assessment of China and Korea illustrates that there are some cross cultural differences which might be related to different political and economic conditions as well as different previous experiences with food safety issues. In modern societies, the risk assessment and management have become more contentious at a societal level, and have become the focus of the societal debate, an effect characterized by more polarized views and controversies across and within different communities (Slovic 1993).

The regulation of food is multi-dimensional, as it is not only a matter of economics and politics, but also the quality assurance and protection of consumers against the food-related diseases are becoming critical issues for the regulatory policy. Furthermore, the producers, marketers and governments may need to focus on the perceived importance of food safety rather than the actual importance because the consumers base their consumption patterns on what they perceive to be risky, rather than what is actually risky (Smith and Riethmuller 2000). In order to maintain the consumer trust, a coherent system of risk regulation may need to entail the social and political considerations and should be based on the negotiation and deliberation with the civil society. A comprehensive food safety policy may need to consider and incorporate socially significant concerns about the agri-food system- justice, equity, democracy and transparency, sovereignty and sustainability, responsibility and accountability (Worosz et al. 2008); and capture the structural complexities of the agri-food system, while embodying the moral and cultural values that matter most (Burstein 1991; Thonney and Bisogni 1991).

This structure of risk management may become increasingly more important as the international trade of agri-food products between these two countries is anticipated to increase substantially. Thus, to facilitate the international dialogue about food safety measures and risk management among trading partner countries, it is imperative that both Korean and Chinese governments develop an effective regulatory system that synchronize their food safety monitoring and risk management systems to earn the public trust, and this has to be effectively communicated and publicized to the public.

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