Consumer Perception Towards Meat Safety: Confirmatory Factor Analysis

MIMI LIANA[a], ALIAS RADAM[b*] AND MOHD RUSLI YACOB[c]

[a,b,c]*Universiti Putra Malaysia, Malaysia*

ABSTRACT

This study was conducted to analyze consumers' perceptions on meat safety. The results indicate that the main determinants of consumer perceptions are government's safety awareness, campaigns and health conscious. Therefore, from the practical standpoint, it suggests that responsible parties should focus their attention on the development of products that have attributes such as proper packaging, labelling and GMP guaranteed in order to increase positive perception of meat safety among customers.

Keywords: Food safety, meat safety, consumer perception, Confirmatory Factor Analysis (CFA), Structural Equation Model (SEM)

INTRODUCTION

Due to rapid technological advancement, present consumers in all ages are able to access any information almost instantly. Today's consumers are better educated and hence, more updated about issues regarding food safety as compared to those in the pass. Nowadays, a number of factors are taken into consideration when deciding on a purchase. Besides the price of the product, factors such as appearance, convenience, and perceived quality as well as safety influenced the decisions made in the marketplace. Hence, consumers are leaning towards food products that benefit their well-being. This phenomenon has also been found to occur in Malaysia where consumers are now demanding food products which are safe and are of good quality at a reasonable price. Malaysian consumers are becoming very sensitive towards issues concerning health and food safety. Another major consumer's concern particularly muslim consumers in Malaysia is *halalness* of foods. For example, the issue regarding meat products with a questionable *halal* status is

---

receiving a widely negative publicity from the Malaysian media. This is because a majority of Muslim consumers will not accept meat products that are not certified *halal* by the Malaysian religious authority. Besides these concerns however, price remain an important factor in consumer's purchasing decision. The United States Department of Agriculture (USDA) revealed that Malaysian consumers are also becoming more price sensitive towards value-for-money products (USDA, 2006). Therefore, industrial players are incessantly challenged to produce new innovative products at lower costs without compromising on quality.

As a matter of fact, food safety is an important issue that affects anyone who consumes food. One of the most popular issues of food safety is the outbreak of food borne diseases, or commonly known as food poisoning. Food poisoning is caused by the intake of food which is contaminated with dangerous bacteria (pathogens) or toxins. Food poisoning can be classified into 2 levels namely, mild and serious. Mild food poisoning triggers a few episodes of vomiting and diarrhoea while serious food poisoning could cause continuous vomiting, diarrhoea or bloody diarrhoea, as well as fever leading to severe dehydration. *E.coli O157:H7* could set off bloody diarrhoea that could occasionally lead to kidney failure and sometimes death. Most of these dangerous bacteria are present in animal-based products like meat, fish, eggs and milk. The high protein content in these types of foods allow it to be easily contaminated resulting in food poisoning if not handled and cooked properly before consuming. These already contaminated foods may pollute other cooked food, should the same utensils are used for both without washing them properly.

Although most food borne infections are undiagnosed and unreported, the Centre for Disease Control and Prevention estimated that there were an increasing number of illness cases of food poisoning in Malaysia. According to the reports from the Food Safety Quality Division (FSQD), Ministry of Health (2008), there are 14,455 reported cases of food poisoning in 2007, with an incidence rate of 53.19 per 100,000 populations. The report revealed that, Selangor has the highest number of food poisoning cases, followed by Perak, Terengganu and Kelantan. Out of these cases, most of them involved school students. In addition to that, the National Consumer Complaints Centre (NCCC), a non-profit body and an affiliate to Federation of Malaysian Consumers Associations (FOMCA), has received numerous complaints from consumers relating to contamination of food. In 2007, the NCCC's statistics registered more than 460 food-related complaints. Out of these complaints, nearly 75 per cent or 360 complaints are on safety issues (Melati - Bernama, 2008). Most of the complains concerned issues like improper or absence of labelling, sale of products that are exceeded their expiry dates, contaminated equipment, failed to compliance to the procedure of food safety, as well as food safety incidents such as existent of melamine in foods, BSE (Bovine Spongiform Encephalopathy), dioxin, nitrofurans, and outbreaks of microbial food borne diseases.

Although specific concern may vary between countries, it is clear that "safety" is becoming an important issue to consumers in making purchasing decisions, resulting in an effect on future consumption levels. It is supported by Food Marketing Institute (FMI), which found that 69 percent of consumers considered product safety as a very important factor in food selection (FMI, 1994).

In response to the falling meat demand, producers, supermarkets and restaurants increased their expenses on advertising and promotion of beef products hoping that this would contribute to the restoration of consumer's confidence in meat. Most barbecue restaurants changed their menus to include non-meat dishes and lower their prices to maintain their customer base (Ono and Stecklow, 2001).

As a result of that, ensuring the safety of food is a shared responsibility among producers, industries, government, and consumers. Moreover, there is a need for improved physical, biological and economical data on safety of meat to be available to consumers, producers, processor and regulators. These data will enable all stakeholders to analyse and comprehend the state and trend of food safety in the country. An understanding of the factors that determine consumer perception of a product's value or cost is of crucial importance to an industry's product innovation, choice of marketing and communication strategy and maintenance of competitive advantage (Nielsen, 1998; Jongen and Meulenberg, 1998). The above mentioned issues and consumers' changing attitudes toward food products are the motivations for conducting this study. Therefore, the overall objective of this study is to present insights in consumers' perception towards safety in meat consumption. The focus of this paper is to reveal findings and propose recommendations based on this empirical research. This paper is organized into five sections. First, is an introduction of food safety issues followed by the summary of previous researches in section two. Thirdly, we will explore the research design and explain the data sources, while the main empirical findings are discussed in section four. From these findings, policy implications and recommendations pertaining to livestock farming, the meat industry, government, as well as for future scientific and empirical research are set fifth.

LITERATURE OVERVIEW

Food safety is an important issue facing current consumers, the food industry and the government. Since consumers cannot themselves easily assess food safety risks, their perception of food safety is, in part, a matter of trust in the food chain. Over the past years, consumers' concern has arisen over food hazards. Amongst these, Bovine Spongiform Encephalopathy (BSE), salmonella, and farm animals fed with antibiotics and hormones are the greatest concern in the UK. As a result, meat production and consumption have been under heavy criticism all through the last decade. Many interested parties including consumers, industries, producers

and governments, as well as scientists from a plethora of disciplines, have recently been involved in debates that were initiated by numerous occurrences and stirred up by conflicting motivations and influencing factors. Meat has been referred to as the food item in which consumer confidence decreased most during the last decade (Richardson *et al*., 1994; Becker *et al*., 1998).

People's perceptions of the food system present evidence about the confidence people have in it. Regardless of the steps, farmers, businesses and government agencies alike take to insure a safe food supply; but food safety will ultimately reside alongside public perceptions (Andrew and Warland, 2004). Consumer behaviours based on these perceptions, whether accurate or not, can have significant impacts on the food industry (Bruhn *et al*., 1992; Fein *et al*., 1995; Frewer *et al*., 1994; Jordan and Elnagheeb, 1991; Jussaume Jr. and Judson, 1992; Lin, 1995; Schafer *et al*., 1993). In 1989, for example, fear about the use of the pesticide "Alar" on apples led to the dumping of apple juice down drains and apples rotting in warehouses. Consumers shunned apples and all apple related products leading to a devastating economic lost for apple growers and processors (Wagner 1999). More recently, public concern about "Mad Cow Disease" or Bovine Spongiform Encephalopathy (BSE) and "Foot and Mouth Disease" led to the destruction of millions of cattle in Britain, and dramatic economic losses for the beef industry across Europe (CNN, 2000).

It is also important to note that consumer perceptions are not constant over time (Five-Shaw and Rowe, 1996). Since meat safety concerns are still significant today, it is important to look towards the growing importance of animal welfare consciousness in developing a certain level of perception when making meat consumption decisions. Previous research that had an inspection of attribute rating profiles and statistical validation revealed that problems of the meat image were mainly related to meat's bad perception on trustworthiness and safety-related product attributes, such as containing hormone residues or harmful substance (Verbeke, 2000). For example, problems related to the pork image mainly pertained to pork's is perceived as the most fatty, the worst tasting, the least healthy and the overall lowest quality meat. In contrast, poultry meat received by far the most positive perception scores, especially on the attributes leanness, healthiness and safety.

Since the 1990s, literatures have indicated the importance of animal welfare in consumer preferences (Verbeke and Viane, 1999). Harper and Henson (2001) determined that consumers in Western countries were more influenced by the ethical aspects of food production than by their cost, and there was a growing interest in the animal welfare standards associated with production. However, McCarthy *et al*. (2003) discovered that animal welfare did not significantly affect the attitude toward beef and its consumption in Ireland. Some studies indicated that animal welfare were relatively less important than other attributes, such as animal feeding, origin (Bernués *et al*., 2003), appearance and price (Davidson *et al*., 2003).

As time passes, it appears that consumers are increasingly expressing quality concerns and difficulties in assessing quality fresh meat over time. Quality labels can give consumers another means of inferring experience and credence characteristics of food products (Grunert, 2002). Organic and free-range logos increase consumer expectation of quality and healthiness (Bech-Larsen and Grunert, 1998; Bredahl and Scholderer, 2004; Scholderer *et al.*, 2004). Meat labels can provide consumers with not only nutritional information, but also provide thawing, cooking and storage guidelines, as well as suggest menu ideas. One previous research that studied the perception on fresh meat quality in Germany found that labelling was second in importance after country of origin, while more than 50 per cent of respondents regarded the price as not being significant (Becker *et al*, 2000). This was supported by Rimal and Fletcher (2003) who mentioned that nutrition and ingredient information on meat labels were positively correlated with perception and attitude towards meat as well as meat consumption frequency. Similar conclusions were drawn related to consumer's perception on beef quality labels. A considerable part of the interviewed consumers claimed to buy labelled meat but failed to recall any label unaided. Additionally, features and benefits were assigned to quality labelled meat that did not correspond to the actual performance of the label (Verbeke, 2000).

In addition, the relation between health conscious and attributes importance revealed that meat was still appreciated in general because of its taste and convenience in preparation. Consumer's perception on pork for instance, was found to be worse compared to beef and poultry on leanness, healthiness, and attributes relating to eating or sensory quality, i.e. taste and tenderness (Verbeke, 2000). On the contrary, it was scientifically proven that pork could be low in fat and cholesterol, or excelling in taste and tenderness, depending on the specific cut and handling throughout the meat chain.

Schroeter (2001) revealed that problems with cleanliness in processing and packaging of beef, bacterial contamination of meat during the slaughter process, exposure of meat to faecal material, and concerns relating to grinding and packaging were important factors that determine perception on food safety. Most importantly, farm practices that secure foods quality must be objectively verifiable (Mojduszka and Caswell, 2000). Quality assurance schemes had been seen as relatively important in the purchase of mince beef and such schemes were valued directly by consumers (Walley *et al.*, 1999; Northen, 2000). The livestock industry, therefore, may demonstrate integrity by disclosing its husbandry practices, following regulations and guidelines to manage perceived risk and positively influencing the perception of safety, quality and wholesomeness of meat (Yee and Yeung, 2002). Consumers' response to these food safety policy measures acknowledged the presence of offsetting behaviour in food consumption (Miljkovic *et al.*, 2009).

RESEARCH METHODOLOGY

As an extension of the previous study, data from the same sample was utilized in this study. An interview was conducted in order to gather data in a face to face setting using a set of guidelines from a prepared questionnaire. A total of 243 respondents were selected and interviewed using convenience sampling in Klang Valley area. Respondents were asked about their socio-economic profiles along with their perception and attitude towards meat safety.

More than half of the respondents (58%) came from urban areas while the rest were from rural areas. Majority of the respondents (66.3%) were female while only 33.7 % were male. In terms of household size, most of the respondents (39.9%) hadve two to four family members. More than half of the respondent (56.8%) received college or university education while 41.9% and 1.23% had only secondary education and primary education respectively. In terms of occupation, majority of the respondents (44.4%) worked in public sectors rather than private sectors (7.41%), self-employed (7.41%), housewife (0.82%) and others (39.9%). Finally, 48.5% had an income of above RM3000 per month.

Data Analysis Technique

Principal Component Analysis (PCA) with Variamax rotation was employed in this study in order to determine the underlying dimension and perception of safety meat items. As a result of that, four factors were extracted with eigenvalue of above 1.0 and a total variance of 62.524 percent. These four dimensions were labelled as government involvement, meat awareness, health conscious and product potential.

Therefore, to confirm the underlying dimensions that were obtained in the previous study, Confirmatory Factor Analysis (CFA) was conducted. CFA was utilized to examine the construct validity of the instrument. Confirmatory Factor Analysis (CFA) is one of the most commonly employed tools to test the construct validity of developed instrument (Hair *et al*, 2006). Moreover, this technique provides a more rigorous interpretation of dimensionality than the Exploratory Factor Analysis (EFA) technique (Diana, 2006). In addition, CFA is useful as an interpretation of model fit indices (Schumacker and Lomax, 1996).

For the purpose of this study, the second order CFA that is embedded in Structural Equation Model (SEM) was employed. SEM is a statistical modelling technique that combines factor analysis and multivariate multiple regressions (Hair *et al*, 2006). Compared to traditional methods which normally utilize one statistical test to determine the significance of the analysis, SEM, CFA in particular however, relies on several statistical tests to determine the adequacy of model to data fit. The chi-square test indicates the range of difference between expected and observed covariance matrices. A chi-square value close to zero indicates little differences between the expected and observed matrices.

Another test is the Comparative Fit Index (CFI) which is equals to the discrepancy function adjusted for sample size. CFI ranges from 0-1 with a larger value indicating better model fit. Acceptable model fit is indicated by a CFI value of 0.90 or greater. The Root Mean Square Error of Approximation (RMSEA) is related to residual in the model. RMSEA values range from 0 to 1 with a smaller RMSEA value indicating better model fit. Acceptable model fit is indicated by an RMSEA value of 0.06 or less (Hu and Bentler, 1999). Lastly, for the purposed of this study, the goodness-of-fit measures which were GFI, AGFI, IFI and CFI were > 0.90 and RMSEA was <0.08, were employed as a standard requirement of fit statistic.

RESULTS AND DISCUSSION

The reliability analyses were conducted to ensure the internal consistency was at least maintained if not improved after item revisions over time. The objective of the reliability analyses is to assess the degree of consistency between multiple measurements and to ensure that responses are not too varied in order for the taken measurements to be reliable. The most frequently used measure of reliability is internal consistency, which is applied to the consistency among the variables in a summated scale. The underlying principle for internal consistency is that, the individual items or indicators of the scale should all be measuring the same construct and thus be highly inter-correlated (Hair *et al*., 2006). In this study, Cronbach's coefficient alpha was used to test the reliability of the 17 relevant variables that were used in the factor analysis. From the analysis, the standardized item (alpha) for these variables ranged from 0.674 to 0.852. The alpha scores for each factor were more than 0.5. Hence, it meets Nunnally's (1978) guideline of alpha 0.5 to 0.6 for explanatory research. Nonetheless, Peter (1979) stated that Nunnally's guideline should not be accepted as an absolute standard in marketing research. Peter had even suggested that reliability levels of less than 0.5 might be acceptable in marketing research.

Besides that, in attempts to confirm which items belong to what constructs and to test the construct validity of perception towards meat, Confirmatory Factorial Analysis (CFA) was conducted. Figure 1 shows the measurement model for the factors that affect perception towards meat. "P" represents Perception towards meat, while the second order latent construct for the four underlying dimensions are "HC" (Health Conscious), "GI" (Government Involvement), "PP" (Product Potential) and "SA" (Safety Awareness).

The results indicate that the parameters are free from offending estimates. Therefore, this suggests that the model is admissible (Hair *et al*., 1998). In addition, according to the results, Chi-Square (χ^2) statistics with $p = 0.000$ does not show a good fit of the model. However, according to Schumaker and Lomax (2004), a sample size of over 200, could affect Chi-Square statistics to indicate a significant

probability level ($p = 0.000$). Hence, this model is considered to be valid for further interpretation in the degree of goodness-of-fit measures and their explanatory power (regression weight) of the causal relationship.
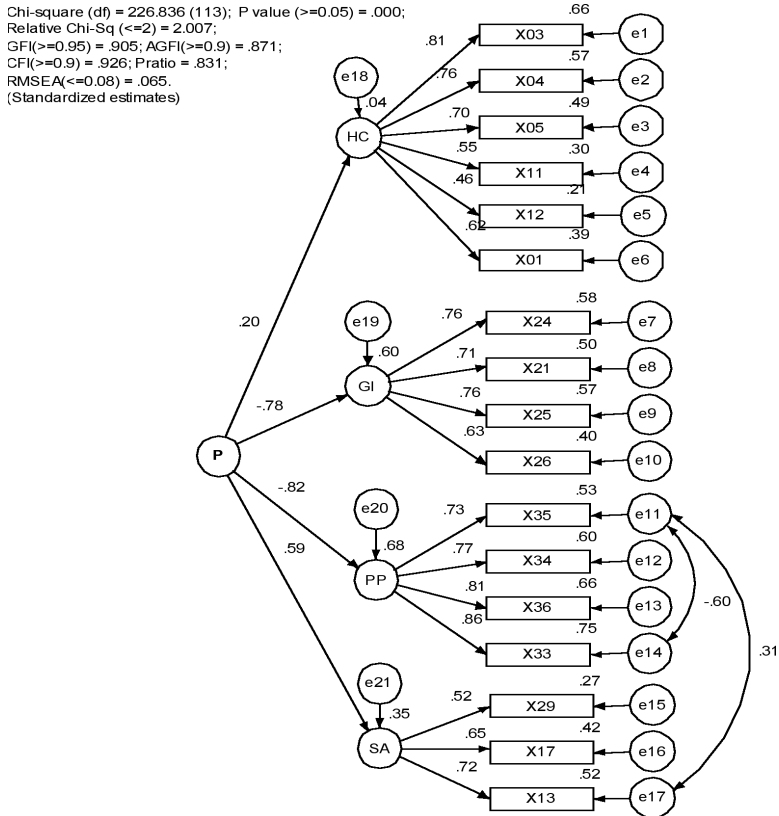

Figure 1 Confirmatory factorial analysis for perception towards safety meat

Moreover, the results of the analysis on the overall fit of the model were very encouraging. According to Hair *et al*. (2006) and Arbuckle and Wothke (1999), the goodness-of-fit measures GFI, AGFI, IFI and CFI were > 0.90 and RMSEA was < 0.08. The results revealed that the fit of the statistics for measurement model of second order CFA (GFI = 0.905, CFI = 0.926) met the conventional standard, with the exception of AGFI (0.871) which was below the accepted values. Besides, all the research propositions were supported by the significant coefficients estimated in the model. Due to this reason, this model was considered to be acceptable. Additionally, the root mean square of error of approximation (RMSEA = 0.065) was well below .08, the standard requirement of this fit statistic (Hair *et al*, 2006). In

short, the results indicated that there were no statistically significant discrepancies between the observed covariance and the implied matrices, implying that the data fit the model.

The results show that perception towards meat accounted for 68% of the total variance in product potential ($R^2 = 0.68$, Y = -0.82). The next highest variance of the second order construct of perception towards meat, was government involvement ($R^2 = 0.60$, Y= -0.78). Perception towards meat accounted for 60% of the variances in the government involvement dimension, followed by third indicator which was safety awareness ($R^2 = 0.35$, Y = 0.59). The least important indicator was health conscious ($R^2 = 0.04$, Y =0.20) which means perception towards meat justifies 0.4% of the variances for health conscious dimension.

In addition to the unobserved constructs, this model was also tested for statistically significant loadings (standardize regression weight) for each item. Table 1 describes the standard error (S.E), critical ratio (C.R) and statistical significant probability values (p) for the items that were summarized in the measurement model of perception of meat. All items were found to be statistically significant at 1% level of confidence, with loading greater than or equal to 0.4. However, the item with the least statistically significant belongs to item; meat in wet market is safe with 0.46 loading.

Table 1 CFA result of loadings, standard error, critical ratio, significant
p-value and item description for perception

Construct	Item	Statement	Loadings	S.E	C.R	P
Health conscious	X3	Tastier	0.81	*	*	*
	X4	More nutritious	0.76	0.077	11.56	0.0
	X5	Safer to consume	0.70	0.082	10.69	0.0
	X11	Safe to eat	0.55	0.077	8.20	0.0
	X12	Meat in wet market is safe	0.46	0.088	6.75	0.0
	X1	Better	0.62	0.089	9.41	0.0
Government Involvement	X24	Price control	0.76	*	*	*
	X21	Education important	0.71	0.093	10.18	0.0
	X25	Government role	0.76	0.093	10.75	0.0
	X26	Follow HACCP	0.63	0.098	9.09	0.0
Product Potential	X35	Local meat safer	0.73	*	*	*
	X34	Properly covered	0.77	0.085	11.01	0.0
	X36	Ensure GMP	0.81	0.092	11.46	0.0
	X33	Labeling	0.86	0.107	10.25	0.0
Safety Awareness	X29	Consumer health level	0.52	*	*	*
	X17	Training on workers	0.65	0.208	6.04	0.0
	X13	Animal disease	0.72	0.176	5.98	0.0

* The value was not estimate due to the required constraint for model identification where non standardized regression weight of the item is fixed to default 1.

To summarize, the perception towards meat safety as a second order construct for three-dimensional measurement model fits the data. Product potential was found to be the best indicator for consumers' perception towards meat safety followed by government involvement, safety awareness and lastly, health conscious. This also bring about the notion that product attributes such as packaging, guarantees in GMP and labelling significantly affect how customers perceived meat safety. This finding is consistent with Grunert, 2002 study, which revealed that quality labels would allow consumers to explore and experience new characteristics of food products Consumers are more prone to eating quality meat when it carries an organic or free-range label, provided that the actual quality does not stray too much from consumers' expectations (Bredahl and Scholderer, 2004; Grunert and Andersen, 2000; Oude Ophuis, 1994; Scholderer *et al*., 2004).

CONCLUSION

As a conclusion, food quality is a very subjective and dynamic concept, not to mention that the perception on meat quality is changing fast. Some of meat safety and quality problems in recent years have endangered consumers' health resulting in a decrease in consumers' confidence in meat supplies resulting in a negative economical impact of meat production and sales. A number of food safety issues are currently being debated at national and international stages. Examples of debated topics include, contaminants (including pesticides residues), irradiation, increased globalization of trade, and nutritional labelling as well as beta agonist that was used in animal feed to promote growth, produce more lean meat and less fat. These crucial and complex matters require immediate attention from stakeholders, for it may have negative impacts on human health, the environment and global economy.

Consumers' perception in livestock industry especially meat and its effect on purchasing behaviour are seen to be important to the food industry. Consumers' confidence on livestock products needs to be rebuilt especially during and after periods of food scares. Without doing so, the welfare of all parties in the supply chain as well as consumers is likely to be negatively affected. Consumers today are more interested in credence quality attributes such as safety, healthiness, labelling and packaging rather than taste or price. The Good Manufacturing Practices, GMP and Hazard Analysis of Critical Control Points, HACCP are certifications and food hygiene is embedded in the two certification requirements. The surveillance of these standards (GMP and HACCP) must be made mandatory and should they not be complied with, necessary actions ought to be taken. Department of Standards Malaysia has developed MS 1514 on General Principles of Food Hygiene and MS 1480:2007 on Food Safety according to HACCP system, however if the standards remain voluntary, compliance will be minimal.

As for food safety, we have Food Safety Act 1983 and Food Regulation 1985 which is under the jurisdiction of Ministry of Health. However, the government

also should consider formulating 'Feed Act'. By introducing and Enforcing on the Feed Act is a good action in reducing the number of beta agonist abuse cases reported over the years. Therefore, by enforcing the Feed Act, heavier penalties will be carried out to those who possess, distribute, or add dangerous ingredients into livestock feed. The act should be empowered to the Fisheries Department, Department of Agriculture, and the Pharmaceutical Division of the Ministry of Health to act against errant breeders. Besides that, our government needs to give a bigger budget for agricultural research and development so that we can produce our own livestock feed without depending on imports such as genetically-engineered corn or soya. The main problem which we face by relying too much on imported livestock feed is a high production cost of livestock

From a methodological standpoint, the SEM technique used here can aid in successfully develop a model to identify the determinants of perception of meat safety. Due to limited resources, the study adopted a non-probabilistic sampling method. Hence the results require cautious interpretation. Further research with a more systematic sampling procedure by probability sampling technique is recommended. Nevertheless, this exploratory study does provide useful insights into the potential benefit from perception building that could be utilized by livestock farmers, food safety regulators and the food supply chain participants as a whole to achieve a desired outcome on the issue of meat safety.

REFERENCES

Andrew K. and Warland, R. (2004) The Relationship between Sociodemographics and Concern about Food Safety Issues, *Journal of Consumer Affairs*, **38(1)**, 107-120

Arbuckle, J.L. and Wothe, W. (1999) *AMOS 4.0 Yser's Guide*. Chicago, IL: Small Water Corperation.

Bech-Larsen, T. and Grunert, K.G. (1998) Integrating the Theory of Planned Behaviour with Means-end Chain Theory: A Study of Possible Improvements in Predictive Validity. In P. Andersson (Ed.), *Proceedings of the 27th EMAC Conference* (pp. 305-314). Stockholm: EMAC.

Becker, T., Benner, E. and Glitsch, K. (1998) Summary report on consumer behaviour towards meat in Germany, Ireland, Italy, Spain, Sweden and the United Kingdom: Results of a consumer survey, *Working paper FAIR-CT95-0046*, Department of Agricultural Markets and Agricultural Policy, The University of Hohenheim, GoÈttingen.

Becker, T., Benner, E. and Glitsch, K. (2000) Consumer Perception of Fresh Meat Quality in Germany, *British Food Journal*, **102(3)**, 246-266.

Bernués, A., Olaizola, A. and Corcoran, K. (2003) Labelling Information Demanded by European Consumers and Relationships with Purchasing Motives, Quality and Safety of Meat, *Meat Science*, **65**, 1095-1106.

Bredahl, L. and Scholderer, J. (2004) Marketing Possibilities of New Pork Qualities, in *Sustainability in the production of pork with improved nutritional and eating quality*

using strategic feeding in outdoor production (Eds.) A.H. Karlsson and H. Andersen, Copenhagen: KVL.

Brooke, J. (2001) *In Japan, Beef Business Sinks in a Sea of Skepticism*. New York Times, A2.

Bruhn, C., Katherine D.K., Feldman, N., Harwood, J., Ho G., Ivans, E., Kubin, L., Lamp, C., Marshall, M., Osaki, S., Stanford, G., Steinbring, Y., Valdez, I., Williamson, E. and Wunderlich, E. (1991) Consumer Food Safety Concerns and Interest in Pesticide-Related Information, *Journal of Food Safety*, **12**, 253-262.

CNN. (2000) *Mad Cow Disease: Counting the Cost*. Retrieved on October 15, 2001 from http://www2.cnn.com/SPECIALS/2000/madcow/.

Davidson, A., Schröder, M.J.A. and Bower, J.A. (2003) The Importance of Origin as a Quality Attribute for Beef: Results from a Scottish Consumer Survey, *International Journal of Consumer Studies*, **27**, 91-98.

Diana, D.S. (2006) Exploratory or Confirmatory Factor Analysis? *Paper No. 200-31, SUGI 31 Proceedings*, San Francisco, California March 26-29, 2006

Fein, Sara, C.-T. Lin and Levy, A. (1995) Foodborne Illness: Perceptions, Experience, and Preventive Behaviors in the United States, *Journal of Food Protection*, **58(12)**, 1405-1411.

Food Marketing Institute (FMI). (1994) *Trends: Consumer Attitude and the Supermarket*. Food Marketing Institute: Washington, DC.

Frewer, L., Shepherd, R. and Sparks, P. (1994) The Interrelationship between Perceived Knowledge, Control, and Risk Associated with a Range of Food-related Hazards Targeted at the Individual, Other People, and Society, *Journal of Food Safety*, **14**, 19-40.

Five-Shaw, C. and Rowe, G. (1996) Public Perceptions of Everyday Food Hazards: A Psychometric Study, *Risk Analysis*, **16(4)**, 487-500.

Grunert, K.G. and Andersen, S. (2000) Purchase decision, quality expectations and quality experience for organic pork. Paper presented at *The 9th Food Choice Conference*, Dublin, 28-31 July 2000.

Grunert, K.G. (2002) Current Issues in the Understanding of Consumer Food Choice. *Trends in Food Science and Technology*, **13**, 275-285.

Hair, J.F., Anderson, R.E. and Tantham, R.L. (2006) *Multivariate Data Analysis* (10th Edn.). Prentice Hall: New Jersey.

Hu, L. and Bentler, P.M. (1999) Fit Indices in Covariance Structure Modeling: Sensitivity to Under-parameterized Model Misspecification, *Physhological Methods*, **3(4)**, 424-453.

Harper, G.C. and Henson, S.J. (2001) *The level of consumer concern about animal welfare*. The comparative report. The University of Reading, UK. EU Fair CT98-3678.

Jordan, Jeffrey and Abdelmoneim Elnaghee.b (1991) Public Perceptions of Food Safety, *Journal of Food Distribution Research*, September: 13-32.

Jongen, W. and Meulenberg, M. (1998) Summary and Future Prospects', in *Innovation of Food Production Systems: Product Quality and Consumer Acceptance* (Eds.) W. Jongen and M. Meulenberg, Wageningen Pers, Wageningen, pp. 177-80.

Jussaume, Raymond, Jr., and Judson, D.H. (1992) Public Perceptions about Food Safety in the United States and Japan, *Rural Sociology*, **57(2)**, 235-249.

Lin, Chung-Tung Jordan. (1995) Demographic and Socioeconomic Influences on the Importance of Food Safety in Food Shopping, *Agriculture and Resource Economics Review*, **24(2)**, 190-198.

McCarthy, M., De Boer, M., O'Reilly, S. and Cotter, L. (2003) Factors Influencing Intention to Purchase Beef in the Irish Market, *Meat Science*, **65**, 1071-1083.

Melati Mohd Ariff. (2008) *How Safe Is The Food We Consume*? Retrieved on August 11, 2009 on http://web10.bernama.com/kpdnhep/news.php?id=359149&. Bernama, September 15, 2008.

Nielsen, N. (1998) The Beef Market in the European Union, *MAPP Working Paper 51*, The Aarhus School of Business, Aarhus.

Miljkovic, D., Nganje, W. and Onyango, B. (2009) Food Safety Offsetting Behavior and the Benefits of Food Safety Regulation, *Journal of Food Safety*, **29(1)**, 49-58.

Mojduszka, E. and Caswell, J. (2000) A Test of Nutritional Quality Signaling in Food Markets Prior to Implementation of Mandatory Labeling, *American Journal of Agricultural Economics*, **82(2)**, 298-309.

Northen, J. (2000) Quality Attributes and Quality Cues Effective Communication in the UK Meat Supply Chain, *British Food Journal*, **102(3)**, 230-245.

Nunally, Jum C. (1978) *Psychometric Theory*. New York: McGraw-Hill Book Company.

Ono, Y. and Stecklow, S. (2001) Mad-Cow Disease Fines Japan unprepared as Tokyo Fumbles in Bid to Reassure Public, *Wall Street Journal*, A13.

Oude Ophuis, P.A.M. (1994) Sensory Evaluation of 'Free range' and Regular Pork Meat Under Different Conditions of Experience and Awareness, *Food Quality and Preference*, **5**, 173-178.

Peter, J.P. (1979) Reliability: A Review of Psychometric Basics and Recent Marketing Practices, *Journal of Marketing Research*, **16(1)**, 6-17.

Richardson, N., MacFie, H. and Shepherd, R. (1994) Consumer Attitudes to Meat Eating, *Meat Science: An International Journal*, **36**, 57-65.

Rimal, A.P. and Fletcher, S.M. (2003) Understanding Consumers' Attitude Toward Meat Labels and Meat Consumption Pattern, presented at *the Southern Agricultural Economics Association Annual Meeting*, Mobile, Alabama, February 1-5, 2003.

Schafer, R., Schafer, E., Bultena, G. and Hoiberg, E. (1993) Food Safety: An Application of the Health Belief Model, *Journal of Nutrition Education*, **25(1)**, 17-23.

Scholderer, J., Bredahl, L. and Magnussen, M. (2004) Consumer Expectations of the Quality of Pork Produced in Sustainable Outdoor Systems, *MAPP Project Paper No. 03/2004*. Aarhus: Aarhus School of Business.

Schumaker, R.E. and Lomax, R.G. (1996) *A Beginner's Guide to Structural Equation Modeling*. Lawrence Erlbaum Associates, Mahwah, NJ.

Schroeter, C. (2001) Consumer Attitudes Toeards Food Safety Risk Association with Meat Processing, No. 5, Giessen, November 2001, Center for International Development and Environmental Research.

Verbeke, W. (2000) Influences on the Consumer Decision-making Process Towards Fresh Meat: Insights from Belgium and Implications, *British Food Journal*, **102(7)**, 522-538.

Verbeke, W., and Viane, J. (1999) Beliefs, Attitude and Behaviour Towards Fresh Meat Consumption in Belgium: Empirical Evidence from a Consumer Survey, *Food Quality and Preference*, **10(6)**, 437-445.

Wagner, Holly. (1999) It Came From Earth-The Story of a Good Apple Gone Bad. Frontiers, 6:3. Available at http://www.ohio-state.edu/units/cancer/spsu99front/apple/htm.

Walley, K., Parsons, S. and Bland, M. (1999) Quality Assurance and the Consumer, *British Food Journal*, **101(2)**, 148-61.

Yee, W.M.S. and Yeung, R.M.W. (2002) Trust Building in Livestock Farmers: An Exploratory Study, *Nutrition and Food Science*, **32(4)**, 137-44.

Yee, W.M.S., Yeung, R.M.W. and Morris, J. (2005) Food Safety: Building Consumer Trust in Livestock Farmers for Potential Purchase Behaviour, *British Food Journal*, 17(1), 841-854.