International Livestock Research Institute

Research Report 24

	Clean premises 	Low/marbled fat 	Fresh red meat 	Price ETB/kg 38
1. Official abbatoir stamp present				
2. Official abbatoir stamp present	Unclean premises 	High fat meat 	Non-fresh pale meat 	Price ETB/kg 34

Demand for livestock products in developing countries with a focus on quality and safety attributes: Evidence from case studies

Demand for livestock products in developing countries with a focus on quality and safety attributes: Evidence from case studies

Mohammad A Jabbar, Derek Baker and Mohamadou L Fadiga

Editors

ILRI
INTERNATIONAL
LIVESTOCK RESEARCH
INSTITUTE

International Livestock Research Institute

Editors' affiliations

Mohammad A Jabbar, formerly with ILRI (International Livestock Research Institute), Addis Ababa, Ethiopia and is currently a consultant agricultural economist in Dhaka, Bangladesh

Derek Baker, ILRI, Nairobi, Kenya

Mohamadou L Fadiga, ILRI, Addis Ababa, Ethiopia

Table of Contents

List of Tables

List of Figures

Acknowledgements

Abstract

Rising developing country demand for livestock products propelled by income and population growth, and by urbanization offers poverty reduction opportunities to actors in the supply chain. The increase in volumes demanded also features diversification and increased demand for quality attributes. Reliable food safety and information on animal husbandry and geographic origin have long been recognized as value-adding differentiation mechanisms in the developed world. Anecdotal accounts suggest that this is also the case in developing countries. However, little consistent rigorously researched evidence has been published on this subject. This paper presents results based on case studies conducted in a number of developing countries in Asia and Africa. An overview of the theoretically consistent methods used and a synthesis of the results obtained in the various case studies are presented first followed by the case studies each describing a study of specific commodities in specific developing country locations. A consistent set of results emerges, wherein consumers exhibit willingness to pay for quality and safety in animal-origin foods, and within which this willingness to pay is strongest amongst the wealthy and the urban dwellers. However, the intricacy and variety of quality definition and measurement are demonstrated fully, as they occur between and within countries, commodity groups and other settings. The key message from the results is the evidence that quality and safety considerations in products of animal origin food provide commercial opportunities for developing country producers, market actors and industry participants.

Key words: demand, livestock products, quality, safety, developing countries

Abbreviations and acronyms

ANOVA	analysis of variance
BBS	Bangladesh Bureau of Statistics
BDT	Bangladesh taka
CelAgrid	Centre for Livestock and Agricultural Development
CIRAD	Centre de Coopération Internationale en Recherche Agronomique pour le Développement
CVM	contingent valuation method
ETB	Ethiopian birr
FAO	Food and Agriculture Organization of the United Nations
IFAD	International Fund for Agricultural Development
IIA	independence of irrelevant alternatives
ILRI	International Livestock Research Institute
ISO	International Organization for Standardization
KES	Kenya shilling
LR	likelihood ratio
MALICA	Markets and Agriculture Linkages for Cities in Asia
MRS	marginal rate of substitution
MSG	monosodium glutamate
OLS	Ordinary Least Squares
OPEC	Organization of the Petroleum Exporting Countries
PRA	participatory rapid appraisal
PSU	primary sample unit
RUDEC	Rural Development Centre
SPSS	Statistical Package for the Social Sciences
TND	Tunisia dinar
UHT	ultra-heat treated
USD	United States dollar
VND	Vietnam dong
WHO	World Health Organization

Chapter 1   Introduction

Derek Baker

d.baker@cgiar.org; research scientist at the International Livestock Research Institute, Nairobi, Kenya

Rising developing country demand for livestock products offers poverty-reduction opportunities to actors in the supply chain. Propelled by income and population growth, and by urbanization, this increase in volumes demanded also features diversification and increased demand for quality attributes. Reliable food safety and information on animal husbandry and geographic origin have long been recognized as value-adding differentiation mechanisms in the developed world. Anecdotal accounts suggest that this is also the case in developing countries. However, little consistent rigorously researched evidence has been published on this subject.

Recent work at the International Livestock Research Institute (ILRI), and with a large number of its partners, has focused on these topics. A selection of the resulting work is presented in this volume, as the proceedings from a symposium held in Beijing, China in August 2009 at the Biennial World Congress of the International Association of Agricultural Economists. The symposium brought together researchers and development actors from across the developing world and covered methods, results and recommendations. Case studies were presented and discussed in some detail, with the goals of bringing this emerging field of study to a wider audience and of promoting the results reached.

The proceedings are led by an overview of the theoretically consistent methods used and a synthesis of the results obtained. Case studies then follow, each describing a study of specific commodities in specific developing country locations. A consistent set of results emerges, wherein consumers exhibit willingness to pay for quality and safety in animal-origin foods, and within which this willingness to pay is strongest amongst the wealthy and the urban dwellers. However, the intricacy and variety of quality definition and measurement are demonstrated fully, as they occur between and within countries, commodity groups and other settings.

The extent to which these results are analogous to those obtained in developed markets, as opposed to being an indigenous feature of developing countries' food systems, is left to the reader to ponder. More importantly, the results provide evidence of commercial opportunities for developing country producers and industry participants; it is this message that these proceedings offer above all else. It is hoped that the reader can employ this volume, in whole or in part, in taking this message to policymakers, the private sector and the aid community.

Chapter 2   Demand for livestock products in developing countries with a focus on quality and safety attributes: Evidence from case studies: A summary of concepts, methods and findings

Mohamadou L Fadiga,[1] Derek Baker[2] and Mohammad A Jabbar[3]

1. m.fadiga@cgiar.org; research scientist at the International Livestock Research Institute (ILRI), Addis Ababa, Ethiopia
2. d.baker@cgiar.org; research scientist at the International Livestock Research Institute, Nairobi, Kenya
3. mjabbar2@gmail.com; was a senior agricultural economist at ILRI, Addis Ababa, Ethiopia and is currently a consultant agricultural economist in Dhaka, Bangladesh

Introduction

Consumers in developing countries are becoming more cognizant of health-related hazards in the animal products they buy; their awareness and desires for better quality and safer products are increasingly translated into an effective demand because of higher income and increased urbanization. For this effective demand to be sustained, it has to be catered for by producers who are expected to respond to higher premiums that desired attributes would command in the marketplace. This has the potential to improve the incomes and livelihoods of smallholders and other market participants and to be an avenue for the overall development of the livestock sector. The marketing environment in which smallholders operate is primarily comprised of informal distribution channels where safety and quality standards are either lacking or inadequately defined. The prevalent use of locally defined standards based on consumers' preferences and responses by market actors, and the scanty empirical knowledge about which attributes are valued by which segment of consumers justify the need for more studies. The chapter intends to address this knowledge gap through various case studies that use different methods and procedures guided by their conceptual underpinnings and the prevailing data constraints that characterize informal markets with heterogeneous actors.

Conjoint analysis, hedonic models, contingent valuation and discrete choice models are the main procedures used to analyse consumer preferences. In some cases, simple analytical tools such as descriptive statistics may be more warranted because of data constraints. Conjoint analysis estimates part-worth utilities and the relative importance of quality and safety attributes in terms of their contribution to consumers' stated preferences. Hedonic models estimate the marginal implicit prices, premiums and discounts of any quality

attribute. Contingent valuation methods are used to gauge consumer willingness to pay for an attribute. Discrete choice models estimate consumer willingness to pay for alternative products or a change in level of an attribute, and the welfare implications of any change in attribute level. Regardless of the methods used, the starting point is founded on consumer utility maximization based on product attributes.

These methods can be traced to Lancaster's approach to consumer theory, which states that a good *per se* does not provide utility to the consumer; rather, it is the properties or attributes attached to the good that provide the utility derived from its consumption (Lancaster 1966). Under this framework, a combination of attributes such as official certification, vendor image, cleanliness of premises, fat content and price, to name a few, provides the utility derived from dairy and meat consumption. Some of these are defined as safety attributes and others as quality attributes; what constitutes either remains an open question in a developing country context. Additional issues complicating the analytical framework stem from the underlying trade-offs between these attributes at the consumer level and variation in consumers' valuations across demographic profiles. This chapter addresses the conceptual and theoretical issues and provides empirical evidence from a number of case studies in developing countries to illustrate the complexities of such studies and the need for more research in this field.

Conceptual and methodological issues

A starting point for the analysis of consumer demand based on product attributes is illustrated by $U_{ij} = \phi\left(x_j, p_j, z_i; \theta\right)$ where U_{ij} refers to the utility of consumer i for consuming product j, x_j is the vector of product attributes with various levels, p_j is the price of product j and z_i refers to the vector of individual characteristics such as socio-economic and demographic profiles of consumer. The parameter $\theta = \{\beta, \gamma, \alpha\}$ contains vectors that measure the marginal impact of each of these variables on the latent utility. More specifically, the elements of the parameter vector $\beta = \partial U_{ij}/\partial x_j$ represent the marginal utility of product attributes, $\gamma = \partial U_{ij}/\partial p_j$ is the marginal impact of price and the vector $\rho = \partial U_{ij}/\partial z_i$ captures the marginal impact of socioeconomic and demographic factors. It is important to point out that in the basic formulation, only product attributes were assumed to confer utility; characteristics of buyers z_i were introduced later by empirical researchers. Moreover, price is included in the utility function because it is sometimes interpreted as an indicator of quality. Lastly, the vector of product attributes x_j includes safety and quality attributes, which in some studies involves variables such as cleanliness of sale premises and vendor image, which are characteristics or profiles of the seller.

This specification illustrates a hierarchical decision-making process whereby consumer preferences arise from prior behavioural states that encompass awareness, interest and constraints such as income, socialization and age (Louviere et al. 2005). Consumers rate and rank their preferences of various products through this process and transform their desires into an effective demand. There is a linear relationship between the unobservable latent utility and the observable preference rating (R_{ij} below), assuming additivity and linearity of individual consumer utility, constant interval rating scale, and error term normality as stated in Louviere et al. (2005). The relationship can be stated as follows:

$$U_{ij} = \alpha_0 + \alpha_1 R_{ij} + \varepsilon_{ij} \qquad (2.1)$$

If these assumptions hold, preference rating can be expressed as a linear function of the latent utility and hence, can be specified as a function of product attributes, price and demographic variables. Thus, preference rating can be modelled as follows:

$$R_{ij} = \mu + x_j\beta + \gamma p_j + z_i\rho + \varepsilon_{ij} \qquad (2.2)$$

The estimation is conducted using a linear analysis of variance (ANOVA) model with main effects in which quality attributes are class variables or using regression with these variables coded as dummies. In conjoint analysis parlance, the elements of the parameter vector $\beta = \{\beta_{jl}\}$ are referred to as the estimated part-worth utilities. They represent the contribution of each level l of each attribute in the vector x_j to the ith consumer's stated preference for product j. The papers by Jabbar and Admassu (in this volume) and Jabbar and Fakhrul Islam (in this volume) are based on traditional conjoint analysis whereby the contribution of each quality and safety attribute is estimated using a linear model that yields the part-worth utilities and the relative importance of each component in terms of its contribution to utility. The determinants of stated preference are evaluated using Ordinary Least Squares (OLS) with rating as dependent variables and the safety attributes, quality attributes and socioeconomic and demographic factors as independent variables.

An alternative conceptual analysis arises from the fact that the consumer hierarchical decision-making process involves several states representing a series of conditional outcomes that lead to the choice of one product from many. The possibility to select one of many options, or to select none of the available options, is at the foundation of the concept of choice-based conjoint analysis and renders this framework consistent with demand theory (Louviere et al. 2005). This framework is founded on McFadden's (1974) random utility theory whereby the latent utility $U_{ij} = \phi\left(x_j, p_j, z_i, \varepsilon_{ij}; \theta\right)$ at the basis of the consumer decision-making process is decomposed as a sum of its systematic (explainable) component $V_{ij} = \phi\left(x_j, p_j, z_i; \theta\right)$ and a stochastic (random) component ε_{ij}, that is, $U_{ij} = V_{ij} + \varepsilon_{ij}$. The random utility can be explicitly specified as follows:

$$U_{ij} = \mu + z\rho_i + x_j\beta + \gamma\rho_j + \varepsilon_{ij} \qquad (2.3)$$

The importance of the random utility specification posits on its role in determining the form taken by the error terms of the derived choice-based models while providing a consistent framework that reconciles the fundamental assumption of utility maximization and the underlying random nature of quality-based demand analysis. This is especially important in informal markets, which are asymmetric by nature, that is, information about quality and safety attributes is not evenly distributed between transacting parties. Moreover, measurements of quality and safety attributes are often based on perceptions, and if measured, they are not free of measurement errors arising from omitted attributes, discrimination errors and unmeasured preferences (McFadden 1986). For an individual i with a choice set represented by C_i, alternative j is chosen over alternative k because of the higher utility it provides. In other words, the probability of individual i choosing alternative j over alternative k is equal to the probability that the utility derived from j is greater than that from k. This can be formally expressed as follows:

$$P_i(j) = P\left(V_{ij} + \varepsilon_{ij} > V_{ik} + \varepsilon_{ik}\right) = P\left(V_{ij} - V_{ik} > \varepsilon_{ik} - \varepsilon_{ij}\right)$$

with $\quad j \neq k \,,\, j,k \in C_i$ \hfill (2.4)

Equation 2.4 represents a multinomial discrete choice model and the underlying error term is the stochastic component of the random utility function U_{ij} in equation 2.3 above. This error term can follow different types of distribution, depending on the nature of the data. Distributions such as logistic, generalized extreme value, heteroskedastic extreme value and normal have been widely discussed in discrete choice models. While some studies, including the ones involved in this symposium, casually assume a specific distribution and choose a specific model from the outset, a more rigorous strategy is advisable because each model may lead to potentially different welfare implications.

Lusk and Schroder (2004) outline a general strategy that can be useful in discrete choice model selection. First, they advocate specifying a universal logit model, which involves the estimation of price and cross-price effects in the utility function of each product alternative (defined by combination of quality and safety attributes) followed by a joint test of these cross-price effects. If the cross-price effects are jointly insignificant, then the assumption of independence of irrelevant alternatives (IIA) holds, in which case a multinomial logit model may be used. If the IIA assumption does not hold then a heteroskedastic extreme value model, multinomial probit model, or a random parameter logit may be specified. The multinomial logit model assumes independence and non-identical error term distribution. The multinomial probit model assumes a multivariate normal, correlated and not identically

distributed error, and the random parameter logit, while similar to the multinomial logit in its IIA assumption, involves stochastic parameters with the underlying stochasticity driven by normally distributed errors. Where the stated preferences can be ranked without any ambiguity, an ordered probit or ordered logit can be estimated, depending on the underlying distribution of the error term.

The estimated parameter vector of the discrete choice model can be used to derive consumer willingness to pay for any attribute level defined as the negative of the ratio of marginal utility of attribute to marginal impact of price, that is, $wtp_{jl} = -\beta_{jl}/\gamma$. Such a model allows interaction terms without compromising efficiency gains, as would be the case for the ANOVA-type models. This strategy minimizes hypothetical bias problems that are often encountered in research seeking to probe consumer willingness to pay for a specific product attribute using contingent valuation methods. Contingent valuation methods ask respondents to price alternative products rather than rating them as in the case of conjoint analysis (Stevens et al. 1997). Pedregal et al. (in this volume) and Lapar et al. (in this volume) used contingent valuation method. Pedregal et al. sought to determine the maximum amount consumers would be willing to pay for improved safety and quality attributes in sausage and pork fillet production in Vietnam. Lapar et al. used a two-step procedure that included a dichotomous choice contingent valuation method to gauge what Northern Vietnamese consumers were willing to pay for various attributes of fresh pork and *gio* (a locally processed pork product), and a tobit model to analyse the factors that determined consumer willingness to pay.

In any case, the papers by Zaibet and Mtimet (in this volume) and Wanyoike et al. (in this volume) specified an ordered probit model while that of Makokha and Fadiga (in this volume) used an ordered logit model. All three papers derived the willingness to pay for particular attributes. Whether based on contingent valuation, as in Pedregal et al. and Lapar et al. or derived from discrete choice model estimation as in Wanyoike et al., Zaibet and Mtimet and Makokha and Fadiga (all in this volume), the derived willingness to pay represents consumer valuation of quality and safety attributes. It has important policy implications, especially in informal markets with inadequately defined safety and quality standards. In such a context, the derived willingness to pay is a signal to agents on the supply side, and a basis for adjusting their operations to respond to consumer demand expectations on quality and safety preferences. Hence, it can have profound impacts on the structure of the livestock sector in developing countries and needs to be interpreted and applied with care. As a point estimate, its empirical relevance can be improved through parametric bootstrapping to generate confidence bands that help us understand the degree to which consumer valuation of these attributes is significant or not. Information on how this procedure is applied to willingness to pay can be found in Lusk et al. (2003) and Lusk and Schroeder (2004).

Ten case studies conducted in different developing countries are reviewed below in terms of concepts, methods of analysis and results. These studies were not conducted under a predesigned common framework; rather, they were conducted mostly independently and, in some cases, as a component of a larger study. However, the purpose of the review or synthesis is to bring together the common threads, knowledge or methodological gaps and draw lessons for future studies. Table 2.1 provides a synopsis of these studies, including the commodity of interest, the location of the studies and the analytical framework used.

Table 2.1. *Synopsis of the case studies in this volume*

Authors	Country	Commodity	Analytical method
Lapar et al.	India	Milk	Descriptive statistics
Jabbar and Admassu	Ethiopia	Milk, butter and beef	Conjoint analysis
Grace et al.	India	Milk	Participatory risk assessment
Jabbar and Fakhrul Islam	Bangladesh	Milk and beef	Conjoint analysis
Makokha and Fadiga	Kenya	Milk and beef	Choice-based conjoint analysis
Wanyoike et al.	Kenya	Camel milk and camel meat	Choice-based conjoint analysis
Zaibet and Mtimet	Tunisia	Sheep and goat meat	Choice-based conjoint analysis
Lapar et al.	Vietnam	Pork	Contingent valuation
Borin et al.	Cambodia	Pork	Contingent valuation
Pedregal et al.	Vietnam	Pork	Contingent valuation

Data considerations

Conducting demand studies with an emphasis on product attributes can be daunting because of lack of objective safety and quality standards. Where these standards exist, they are often antiquated, thus not suited to the development of consumer-driven markets that could lead to value addition in the chain. In general, quality attributes pertain to the organoleptic and nutritional attributes (taste, colour, smell, purity etc.) of a product and safety attributes are those that encompass microbial, chemical and physical hazards present in the product during its production, transformation and handling stages, whether as contaminants or inputs. Safety attributes are reflected through packaging, cleanliness of premises, presence of veterinary stamp etc. The quality and safety attributes are identified based on how consumers perceive them and what producers and market agents perceive to be important to consumers. Frequently, a rapid market appraisal is conducted to identify the quality and safety attributes that consumers find desirable, followed by a detailed survey that asks consumers to rate various products, as in Jabbar and Admassu, Jabbar and Fakhrul Islam, Makokha and Fadiga, Wanyoike et al. and Zaibet and Mtimet. Sometimes a large sample survey is conducted from the outset to ask consumers to simply rate various safety and quality attributes as in Lapar et al. and Borin et al.

The thrust of the studies by Lapar et al. on raw fresh and powdered milk in Assam; and Borin et al. on pork in Cambodia was to understand which quality and safety attributes were important to consumers. The ratings were analysed by simple descriptive statistics. Neither of these two studies considered price as an attribute and thus, could not provide an estimate of consumers' valuation of these attributes. Some studies—including Jabbar and Admassu, Jabbar and Fakhrul Islam, Makokha and Fadiga, Zaibet and Mtimet and Wanyoike et al.— consider price as an attribute, which is used in various combinations to define a number of product alternatives used in the structured survey. Consumers are asked to rate and/or rank the various product alternatives presented to them based on their quality and safety attributes. It is difficult, if not impossible, to ask consumers to rate all possible product profiles. These procedural issues are resolved by choosing the profiles from an orthogonal array, which is a subset of the full factorial design. The retained product profiles are used for conjoint analysis and further empirical analysis.

Summary of findings

An analysis of the results highlighted some key principles across the papers. First, the majority of respondents were female, indicating that the main decision-maker on purchases may not be the main income earner. Second, it was difficult to separate quality from safety as attributes listed kept cropping up in both categories. Third, a negative price effect was found in all models that included price in their variable specification. Fourth, the majority of the surveyed consumers procured their meat and dairy products through traditional markets. The findings summarized in this section are an important contribution because they address the vexed topic of consumer demand for product quality and safety in a difficult setting. The marketing environment is characterized by a dominance of the traditional 'wet' market, inadequate or non-existent standards and norms on quality and safety, and, in most cases, a lack of prior studies that can be used as guiding principle.

Consumption issues

Consumer valuation of a specific attribute is conditioned by the intended use of the product. For instance, Lapar et al. found that fresh milk was preferred to processed or powdered milk in Assam because fresh milk was preferred for mixing with tea, drinking, making sweets or making yoghurt. So, powdered and fresh milk are not substitutes but are use-specific. Jabbar and Admassu produced a similar analysis regarding beef in Ethiopia where lean meat was preferred for *kitfo* (minced beef) while fatty meat was preferred for *tibbs* (fried meat).

Although milk was commonly boiled before consumption, handling practices and the widespread lack of refrigeration across the value chain significantly increased the health risks

associated with consuming milk in Assam. Grace et al. analysed the risks associated with different pathways between production and consumption that involve distribution by farmers, traders, street vendors, door-to-door vendors, sweet manufacturers and sellers, and many variants. Safety was measured by total plate count and coliform count and quality by content of fat, solids-not-fat and added water. In general, safety and quality problems increased with the length of the pathway.

The conceptual analysis illustrates, among other things, the role that socioeconomic factors play in the hierarchical decision-making process that leads consumers to choose a specific product profile. The empirical studies show clear influences of income on meat and milk products consumed. In the case of Kenya, Makokha and Fadiga found substantial differences in current consumption patterns as opposed to 10 years ago, apparently due to availability (as identified by 25% of respondents), affordability and changes in quality and safety. Additional dairy products such as cheese and various choices of meat are also now available and widely consumed. This is primarily influenced by a rise in consumers' income as previously hinted.

How quality and safety attributes are defined and viewed

The quality and safety attributes are retained based on how they are perceived by consumers, i.e. what producers and/or other market participants perceive is important to consumers. How they are defined depends on the product and sometimes on the study. In some cases, as in Grace et al., quality and safety are measured using devices such as lactometers and diagnostic kits to measure milk purity and total plate and coliform counts, respectively.

For analysis of quality and safety of milk and milk products, Lapar et al. used taste, nutritional value, price, availability, hygiene, shelf life and packaging for raw fresh milk and powdered milk. Additional quality attributes that Assamese consumers considered were type of animal feed (grass vs. concentrate) and origin of the product, i.e. whether it was sourced from the producer's house, home delivered by producers or sold by milk co-operatives. The results indicated that more than 50% of Assamese consumers were satisfied with milk quality. Makokha and Fadiga relied on rating by producers focusing on quality attributes such as flavour, colour and breed, and safety attributes such as freshness, level of impurities, level of drug residues and packaging. The study also featured rating by traders and consumers, which used as quality attributes cleanliness of premises, packaging, purity and freshness. These attributes were gauged by visual inspection, smell and, in some cases, by using devices such as a lactometer. The study found that cleanliness was the most important quality attribute followed by product smell, colour and packaging; wealthier urban consumers were found to be more satisfied with milk quality than were their rural counterparts. For safety, while most consumers (63%) were generally satisfied, those in rural areas were more sceptical

compared to their urban counterparts. Jabbar and Admassu looked at flavour, foreign bodies, adulteration, hygiene of personnel and smell for milk quality and safety attributes and found that hygiene, smell and adulteration (more so for poor consumers) were the most important safety attributes. Freshness, smell, flavour, purity (i.e. absence of foreign bodies) and origin of production were looked at for local butter and purity was of greatest concern to consumers. In Bangladesh, Jabbar and Fakhrul Islam found that for fresh milk, price was the most important attribute followed by adulteration, breed of cow and fat content and the order was price, packaging and fat content for pasteurized milk.

Zaibet and Mtimet studied the small ruminant meat market in Tunisia and used age, health of animal, species (i.e. whether goat or sheep), sex of animal and price as quality attributes and veterinary stamp, cleanliness of premises, presence of refrigeration facilities and presence of residues as safety attributes. While over 70% of the surveyed consumers strongly agreed on the importance of veterinary stamp, cleanliness of premises and use of refrigeration, there was far less concern about residues. As for quality attributes, age, health of animal and packaging were perceived as most important. These attributes were used to assemble profiles for a ranking-based conjoint analysis.

For beef, Jabbar and Admassu relied on consumer perception of quality through a participatory rapid appraisal method. They found that fat content, freshness and price (to a lesser extent) were important quality attributes to consumers and that these preferences, as stated earlier, were mostly influenced by the intended use of the product. As for safety attributes, official veterinary stamp and hygiene of premises and staff were found to be important. Overall, 48% of the surveyed consumers believed their most recent purchases of beef were safe and 45% believed they were of good quality. These perceptions were positively associated with income level, especially in Vietnam where wealthier consumers were more sceptical. Makokha and Fadiga found that producers considered animal breed, age and musculature for meat quality; traders considered animal health, vigour and date of last medical treatment; and slaughtermen considered leanness and tenderness of meat. Seventy-five percent of the surveyed consumers believed that beef was safe and based on the rating, cleanliness was the most important attribute followed by texture, stamp and fat content. Jabbar and Fakhrul Islam found that consumers in Bangladesh assigned greatest weight to breed, followed by fat content, sex of the animal and price. These consumers preferred local to exotic breeds, lean meat over fatty meat and bulls over cows, although this latter preference may be correlated with the age of the animal (most slaughtered cows were aged culls).

For fresh pork, Borin et al. found that breed (local or exotic), feed type, leanness, colour, appearance and certification were the attributes that consumers considered when purchasing

pork. Consumers also exhibited preference for different cuts as well as the use of non-industrial feeds in pork rearing. Overall, 96% of urban consumers and 89% of rural consumers said they had concerns about the quality of fresh and processed pork vs. 97% of urban consumers and 95% of rural consumers who indicated concerns about safety of fresh and processed pork. Pedregal et al. studied the role of input factors and found that while people felt that the use of industrial feed produced leaner pork products, which they preferred, there were significant concerns about chemical residues and less desirable flavour that these types of feed induce. Overall, 62% of the surveyed consumers were satisfied with the quality of the fresh pork they bought vs. 51% of consumers who expressed satisfaction with the quality of processed pork. Eighty-one percent of the respondents indicated their concerns about the health of the animals whose meat they bought. Similar concerns were expressed about bacterial contamination in meat by 76% of consumers and about antibiotic and hormone residues in meat by 67%. Food safety was cited by 34% of respondents as the most important factor they considered when purchasing pork while 20% of respondents cited price and 19% cited habit.

Willingness to pay for quality

Lapar et al. used conjoint valuation method to gauge Assamese consumers' willingness to pay higher prices for guaranteed quality and safety. The study found a residential gap in their response with 65% of urban dwellers willing to pay more for guaranteed quality and safety attributes against 32% of their rural counterparts. Borin et al. asked a similar question of Cambodian pork consumers and found about 60% of rural as well as urban dwellers were willing to pay a 10% premium above the normal price if the quality could be guaranteed. There was significant difference between the two groups in terms of safety attributes with 63% of urban respondents willing to pay a 10% premium over the normal price for guaranteed safety against 74% of rural respondents. Pedregal et al. found that 50% of surveyed Vietnamese consumers would be prepared to pay more for fresh pork if improved hygiene were guaranteed compared to 36% for better colour, 30% for leanness and 26% for use of non-industrial feeds. Additionally, the study found that consumers were willing to pay a 5% premium above the normal price for hygiene, colour and leanness combined. Interestingly, a 5% premium above the average price corresponded to the price of pork with more desirable colour and fat cover. For processed pork, over 60% of the surveyed consumers were willing to pay more for processed pork guaranteed free of borax (contaminants) and monosodium glutamate and with better packaging. For borax-free pork, they were willing to pay 5% above the average price. High income consumers, urban dwellers, supermarket shoppers, younger consumers and less frequent pork buyers were all willing to pay a premium for quality and safety attributes.

As previously stated, Wanyoike et al., Makokha and Fadiga and Zaibet and Mtimet derived consumer willingness to pay for quality and safety attributes using ordered probit and ordered logit models. Wanyoike et al. found that for camel milk, freshness commanded the highest premium compared to non-adulteration and packaging. For camel meat, cleanliness of premises evoked the highest premium followed by fine chop and spicing. Makokha and Fadiga found that milk with no smell commanded a higher premium, followed by clean premises and colour. For meat, official stamp had the highest premium, followed by clean premises, soft texture and low fat. Zaibet and Mtimet found that women were more concerned about hygiene than were men, and men showed higher preference for sheep meat over goat meat than did women. The willingness to pay for animal age was the highest, followed by sheep meat over goat meat and packaging.

Discussion and conclusions

Understanding the conceptual and methodological issues that frame consumer demand studies based on attributes enables us to capture the limitations and strengths these papers present and provide a firm ground on which conceptual and methodological improvements as well as policy recommendations can be adequately formulated. The empirical implications are varied and are dependent on the chosen methods. For instance, conjoint analysis can help to understand the relative importance of quality and safety attributes within a product profile in determining consumers' stated preferences. Contingent valuation, although problematic, can help to gauge the premiums these attributes may command in the marketplace. With both methods, one can make recommendations to the supply side through market simulations to see how agents react to signals. However, with discrete choice models, recommendations can be made based on the welfare implications of the adoption of safety standards, informed by a better understanding of the role of quality and safety attributes.

This report is the first attempt to summarize and synthesise empirical studies of developing country consumers' preferences for livestock product quality and safety attributes. The theoretical and empirical foundations employed are presented, and the methods used and results obtained are summarized. Ten studies, employing five different (albeit related) methods in seven countries across seven commodities, are included in this review. This review features the first-ever study of consumer preferences for pork in Cambodia, for example, and several others are of equal novelty.

Alongside basic research into attitudes and practice, a variety of economic concepts has been employed in the studies to examine willingness to pay. These range from stated desires to change, through preferences and into formal experiments, to yield measures of willingness to pay. The safety and quality attributes in question were largely also discovered

during the studies, either as part of a survey, by interviews with local experts, or as a focus group discussion. An interesting feature of the surveys' database is that the great majority of respondents are female, in an environment where males are likely to be the principal household income earners.

Freshness, absence of adulteration, fat content or cover, and various aspects of appearance were generally claimed as major quality attributes of interest to the consumers across a range of livestock products. Packaging and a government inspection stamp (on meat) were also commonly cited as preferred safety attributes. Several studies revealed that quality preferences varied according to consumers' intended end uses, a result consistent with rationality and pragmatism amongst consumers. It is clear that the quality and safety criteria of developing country consumers closely parallel those of their developed country counterparts. Moreover, preferences across those criteria occur in similar patterns across the North–South divide.

A common result was that the consumers studied were reluctant or unable to discriminate between quality and safety. Their assessment of the existing status of food safety varied greatly, but was generally positive and varied by income level and according to rural/urban residence. Safety attributes of most concern also differed along demographic lines; urban Vietnamese feared drug residues in pork more than contaminants introduced during processing, while the reverse was true for their rural compatriots. Similar comments hold for quality attributes; across several of the studies, young people were much more concerned with animal welfare than were other age groups; and preferences for fat vs. lean pork and spiced vs. unspiced camel meat also showed strong demographic effects. Some of the studies revealed change in consumption patterns and in concerns over safety and quality; clearly, these are changing.

The consumers studied were, almost without exception, willing to pay for quality and safety. Frequently, the safety and quality price premiums inferred were substantial. Both statements of willingness to pay and the magnitude of its estimates varied with demographic variables as noted above for concerns and satisfaction with quality and safety. In general, willingness to pay for safety attributes (e.g. government inspection stamp) was found to be higher than that for quality attributes (e.g. texture of meat), although many attributes proved difficult to allocate on those lines (e.g. freshness in milk and presence or absence of packaging with a sell-by date).

Of considerable development significance across these studies is the finding that most consumers were able to find and purchase products that satisfied their demand for safety and quality. In many cases, this occurred in informal markets for products such as milk and camel meat, which serve the overwhelming majority of the developing world's poor producers

and consumers of livestock products. However, a few studies indicated that transmission of demand for attributes between market stages is imperfect, and indeed distorts perceptions of consumer preferences. This transmission problem may benefit some players at the expense of others. Who benefits and how is an important research topic. In several studies, consumers shopping in supermarkets represented a separate demographic, with implications for the delivery system as it diverges along formal and informal lines.

Pathways of market participants were established in several of the studies. These were used, in one case, to identify points associated with risk and in another to identify the potential for value addition. This 'value chain' approach is gaining popularity in development research but has not been widely applied in demand studies. A vital aspect of development research is the identification of tasks, products or attributes for which poor livestock holders have a comparative advantage in markets that they may or may not currently be participating in. This is a vital area of research, greatly enabled by the ambitious and wholly informative work reviewed here.

There is limited evidence of trust, though not the case in short-chain systems, within the value chain, in favour of verification. Several studies showed that willingness to pay was apparent for guarantees of unobservable quality and safety attributes, and as noted above, inspection certificates. Attributes such as animal welfare and place of origin were also found to be in demand, providing further scope for certification. Again as above, these results demonstrate strong similarities between consumers in developed and developing countries.

The diverse methods observed in this review of studies do produce ambiguities and inconsistencies and prohibit a consistent and standardized overview of demand. Amongst the willingness to pay studies, methods ranged from ranking and rating, to stated intentions, to stated preferences and discrete choices of price-delimited options (conjoint analysis). In this respect, the wealth of information delivered outweighs concerns over inconsistency. As one check on consistency, all studies yielded a negative price–quantity relationship, consistent with the fundamental tenets of demand theory. However, for the future, the methods employed should reflect the scope and intended use of results; the private and public sector, for example, have different informational requirements.

The overwhelming conclusion from this review is that poor producers can benefit from serving a consumer who, although poor, is discriminating in terms of quality and safety and is prepared to pay for the right attributes. The extent to which poor farmers have a comparative advantage in supplying those attributes in sustainable systems and relationships is a matter for urgent research. The extent to which existing trading networks can transmit the quality criteria is also of interest to the research and commercial community alike.

Concerns over information recording and transmission raise, as elsewhere, the topic of grades and standards. This represents perhaps the greatest difference between developing and developed countries' practices for livestock products, and is the subject of debate at various levels. The current study has shown that demand certainly justifies the generation and transmission of quality and safety information. How far this needs to be standardized across countries, livestock species, commodities and sales channels remains unclear. A good case may be made that only international trade can bring to bear the forces necessary to deliver a common system of standards, but such research results have yet to emerge. Other forms of quality measurement and publication, perhaps based on indigenous systems, show real promise but require investigation.

References

Case studies reviewed and included in this volume

Borin K, Lapar MLA, Nga NTD, Jabbar MA and Sokerya S. 2010. *Consumer demand for fresh and processed pork in Cambodia.* pp. 160–168.

Grace D, Baker D and Randolph TF. 2010. *Innovative and participatory risk-based approaches to assess milk-safety in developing countries: A case study in Northeast India.* pp. 116–126.

Jabbar MA and Admassu SA. 2010. *Assessing consumer preferences for quality and safety attributes of food in the absence of official standards: The case of beef, raw milk and local butter in Ethiopia.* pp. 38–58.

Jabbar MA and Fakhrul Islam SM. 2010. *Urban consumer preferences for quality and safety attributes of meat and milk in Bangladesh.* pp. 17–37.

Lapar MLA, Choubey M, Patwari P, Kumar A, Baltenweck I, Jabbar MA and Staal S. 2010a. *Consumer preferences for attributes of raw and powdered milk in Assam, Northeast India.* pp. 103–115.

Lapar MLA, Luan NN, Jabbar MA, Figuié M, Quang HV, Moustier P, Binh VT and Staal S. 2010b. *Estimating willingness to pay for quality and safety attributes of pork: Some empirical evidence from northern Vietnam.* pp. 138–159.

Makokha S and Fadiga M. 2009. *Exploiting markets for dairy and meat products' quality and safety: A Kenyan case study.* pp. 72–92.

Pedregal VD, Luan NN, Figuié M and Moustier P. 2010. *Familiarity with consumer expectations to support smallholders: Demand for quality pork in Vietnam.* pp. 127–137.

Wanyoike F, Kaitibie S, Kuria S, Bruntse A, Thendiu IN, Mwangi DM and Omore A. 2010. *Consumer preferences and willingness to pay for improved quality and safety: The case of fresh camel milk and dried camel meat* (nyir nyir) *in Kenya.* pp. 93–102.

Zaibet L and Mtimet N. 2010. *Consumer perceptions of the quality and safety of meat from small ruminants: Implications for livestock keepers in Tunisia.* pp. 59–71.

Additional studies reviewed

Lancaster K. 1966. A new approach to consumer theory. *Journal of Political Economy* 74:132–157.

Louviere JJ, Eagle TC and Cohen SH. 2005. *Conjoint analysis: Methods, myths, and much more.* CenSoc Working Paper No. 05–001. 65 pp.

Lusk J and Schroeder T. 2004. Are conjoint experiments incentive compatible? A test with quality differentiated beef products. *American Journal of Agricultural Economics* 86:467–482.

Lusk J, Roosen J and Fox J. 2003. Demand for beef from cattle administered growth hormones or fed genetically modified corn: A comparison of consumers in France, Germany, the United Kingdom and the United States. *American Journal of Agricultural Economics* 85:16–29.

McFadden D. 1974. Conditional logit analysis of qualitative choice behaviour. In: Zarembka P (ed), *Frontiers in econometrics*. Academic Press, New York, USA. pp. 105–142.

McFadden D. 1986. The choice theory approach to market research. *Marketing Science* 5(4):275–297.

Stevens T, Barrett C and Willis C. 1997. Conjoint analysis of groundwater protection programs. *Agricultural and Resource Economics Review* 26:229–236.

Chapter 3   Urban consumer preferences for quality and safety attributes of meat and milk in Bangladesh

Mohammad A Jabbar[1] and SM Fakhrul Islam[2]
1. mjabbar2@gmail.com; was a senior agricultural economist at the International Livestock Research Institute, Addis Ababa, Ethiopia and is currently a consultant agricultural economist in Dhaka, Bangladesh
2. fakhrulsm@dhaka.net; professor of agricultural economics at Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur, Bangladesh

Abstract

A participatory rapid appraisal (PRA) was conducted to identify criteria and indicators used by urban consumers in Bangladesh to assess quality and safety attributes of beef, goat meat, and raw and pasteurized milk as no official grades and standards currently exist for these products, except to some extent for pasteurized milk. The identified criteria were used to design a conjoint analysis to assess profiles of different products that consumers preferred based on the relative importance of the selected attributes in purchase decisions. Results showed that, other things being equal, the most preferred beef profile was 'low-priced, low-fat meat from a local bull' while the least preferred beef profile was 'low-priced, high-fat meat from an Indian cow'. The most preferred goat meat profile was meat that was 'low-priced, low-fat, fresh (no added water) and from a male animal' while the least preferred goat meat profile was meat that was 'medium-priced, high-fat, from a female animal, and with added water'. Other things being equal, the most preferred profile of raw milk was 'low-priced, low-fat, unadulterated milk from a local cow' while the least preferred was 'high-priced, low-fat, adulterated milk from a crossbred cow'. In the case of pasteurized milk, the most preferred profile was 'low-priced, full-cream milk in a polypack' and the least preferred was 'high-priced, low-fat milk in a paper carton'. The sampled consumers considered fat content to be the least important factor for determining the quality and safety of recently purchased raw fresh milk; rather, they gave the highest consideration to freshness followed by taste and purity. In the case of pasteurized milk, taste was the most important criterion and fat content the least important. These empirically based criteria and indicators may be used as a starting point or basis to define official standards, as they represent revealed consumer preferences or demand backed by willingness to pay. In addition, more studies of a similar nature may be conducted in future to expand and update the criteria and indicators in combination with rigorous laboratory-based parameters to improve the definition of food standards.
Key words: consumer preference, milk, dairy, meat, quality, food safety, Bangladesh

---

Background

Demand for meat and dairy products has been increasing rapidly in Bangladesh, as in other developing countries, propelled by income and population growth and urbanization. Between 1983 and 2005, per capita daily consumption of milk increased by 45% (from 22 g to 32 g), consumption of meat and eggs increased by 80% (from 10 g to 18 g) and consumption of fish increased by 38% (from 29 g to 40 g) (Hossain and Deb 2009). Between 2000 and 2020, the total consumption of eggs is projected to increase by 95% while that of meat is projected to increase by 78%.

Moreover, it is generally observed that consumer demand for reliable quality, food safety and scale of delivery has also been increasing in urban areas. A manifestation of this is the price premium in formal markets (supermarkets and other such outlets) for similar products sold in traditional wet markets. The rapid emergence of supermarkets may be a response to consumer demand for better quality, safety and convenience, and their willingness to pay a price premium for these attributes. However, quantitative evidence on the nature and extent of demand for specific quality and safety attributes is scarce. This is more so in the case of products, especially animal products, in informal markets.

Literature on the demand for food suggests that consumer perception of quality, safety and convenience may influence price and purchase of livestock products (for a review, see Grunert 2005). However, in developing countries official standards for quality and safety are either non-existent or are in place but defined on the basis of developed-country public health norms and thus rarely enforced as they have no real relevance for the level of economic development in the developing world. On the other hand, in the absence of adequate officially defined grades, standards and quality characteristics, and in the absence of mechanisms to ensure those standards in developing countries, local standards are appearing in some situations in formal and informal markets. Consumers and suppliers apparently use certain criteria and indicators to differentiate those qualities and standards, e.g. various notions of 'quality' that may not be easily measurable (e.g. texture, taste), convenience, trust and reputation in certain types of sellers. Some of these may be associated with rather significant 'price premium'. However, an understanding of which quality and safety attributes consumers prefer and are willing to pay for is essential for market actors and producers to be able to respond to those preferences. Also, understanding these attributes and their price premium may provide a basis for initiating specification and harmonization of local grades and standards. Such research work will help refine any western norm-based official standards on the basis of local empirical information.

This paper presents the results of a study in Bangladesh to identify the attributes that consumers use in differentiating quality and safety of beef and goat meat, and fresh and

pasteurized milk; the relative importance of different product-specific attributes; and their price differentials. The rest of the paper is organized as follows: The next section describes the methods used in data collection and analysis. The third section presents the results and discussions, followed by a summary and conclusions.

Methodology

Conjoint analysis: Conceptual and theoretical considerations

Conjoint analysis was employed in this study to assess the relative importance of different attributes of selected products as perceived by consumers. In conjoint analysis, the researcher assumes that the product being evaluated can be defined in terms of a few important characteristics and that when a consumer makes a decision about such a product, the decision is based on trade-offs among these characteristics. The purpose of conjoint analysis is to estimate utility scores, called part worth, for the characteristics. Utility scores are measures of how important each characteristic is to the respondent's overall preference for a product (Louviere et al. 2005).

In the design and launch of successful new products or to understand the changing consumer preferences for existing products, questions are asked on whether a product attribute is important or unimportant to the consumer, what product attribute is most or least desirable in the consumer's mind, and what the market share of preferences is for leading competitor products vs. an existing or proposed product. Conjoint analysis can be used to answer such questions. Conjoint analysis is usually adopted by marketing firms to evaluate the potential attributes of new products and to determine the optimal mixture of multilevel attributes included in those products (Louviere et al. 2005; SPSS 2005).

Conjoint analysis was first developed for, and primarily applied in, marketing studies of consumer goods in developed economies. It can be employed to sort out the relative importance to consumers of product attributes such as safety and quality attributes of beef and dairy products, the subject of this study. However, adaptation of this technique to analyse quality and safety attributes of products in a traditional developing country marketing system poses particular problems which require several modifications to the standard methodology, as standard quality and safety attributes are not always defined.

Conjoint analysis is derived from Lancaster's theory of demand (Lancaster 1971), which posits that the utility an individual will derive from consuming a given product is a function of the characteristics of the product. Symbolically $U_i = U(Z_i)$ where Z_i is a vector of the attribute values for alternative i from the choice set at the disposal of the decision-maker. Since utility is not directly observable, a choice variable representing ratings or rankings of the product

attributes is used in empirical work in place of utility. The choice variable is related to utility as follows:

$$R = 1 \quad \text{if} \quad 0 < U < \gamma1$$

$$R = 2 \quad \text{if} \quad \gamma1 < U < \gamma2$$

$$R = \omega \quad \textit{if} \quad U > \gamma\omega\text{-}2$$

where U is the unobservable utility level, R values are the preference ratings for specific attributes of the product and γ values are the threshold variables or cut-off points linking the respondents' actual preferences with the ratings.

For conjoint analysis, the researcher creates the product profiles composed of selected attributes including price and attribute levels, and asks respondents to rate, rank or evaluate those product profiles. The virtue of conjoint analysis is that it asks the respondents to make choices in the same fashion as the consumer presumably does by trading off features, one against another.

The characteristics of the product are described in terms of its factors and levels. The factors are the general attribute categories of the product, such as fat content, colour and price. In other areas of data analysis they are commonly known as the independent variables. The factor levels (also called features) are specific values of the factor for a particular product, such as high, low or some specific value of a currency, such as Bangladesh taka (BDT)[1] 40. In other areas of data analysis, these are the values of the dependent variables.

For each case presented to the subjects, one factor level is listed for each factor in the product profile. The total number of cases or product profiles needed to represent all possible combinations of factor levels is thus equal to the number of levels of factor 1 times the number of levels of factor 2… …times the number of levels of factor n. The advantage of conjoint analysis is its lower cost and greater precision compared to other techniques such as experimental auction or contingent valuation, due to the repeated measure design. The disadvantage is that it does not focus on the value of a specific attribute, but evaluates a product with several attributes as a choice. Comparison of single attributes is rather rare. It also limits the number of product profiles because of respondents' difficulties in rating more than a few product profiles. Change in an attribute level is also restricted, as adding more levels complicates the process of comparing product profiles (Louviere et al. 2005). The total number of profiles resulting from all possible combinations of the levels may become too great for respondents to rank or score in a meaningful way. For these reasons, frequently only

---

1. Bangladesh taka (BDT). In 2009, USD 1 = BDT 68.8.

a subset of all possible profiles is used in the experiment. The subset, an orthogonal array, is a type of design in which only the main effects are considered and interactions are assumed to be negligible (SPSS 2005).

Output from a conjoint analysis includes importance ratings of attributes, part worth estimates showing preferences for attribute alternatives and correlations relating product rankings from the conjoint model with observed rankings. The utility scores analogous to regression coefficients are called part worth and can be used to find the relative importance of each factor. They are captured by the procedure through a set of regressions of the rankings or scores on the profiles. Since they are expressed in a common unit, the part worth scores can be added together to give the total utility of combination of attributes. The Pearson's R and the Kendall's tau statistics displayed at the bottom of each subject's output is another indication of how well the model fits the data. They indicate correlation between the observed and estimated preferences. As such, these coefficients should always be very high (SPSS 2005).

If there is other information on the respondents, such as background demographics, one might be able to identify factors that influence preferences which may help to differentiate market segments for distinct products. Using the choice variable, the empirical model for such analysis takes the following general form:

$$R = \alpha + \beta X + \lambda Y + e$$

where R is a vector of preference ratings for product attributes (0, 1, 2,..., n); α is a constant; X is a vector of non-stochastic variables capturing the levels of attributes; Y is a vector of non-stochastic variables capturing the consumer's socioeconomic characteristics reflecting the variability of tastes across a portion of the population to which the model of choice behaviour applies; β is a vector of marginal utilities for the levels of attributes, λ is a vector of marginal impacts of the consumer's socioeconomic background and e is a disturbance term. The marginal values β and λ are estimated from observations on R, X and Y. Consumers with the same estimated λ have similar preferences and would make up one segment of the market. Thus, estimates of λ can be used to assess if a consumer segmentation approach to quality improvement is warranted.

Data source and collection

Sampling for consumption survey

The study was conducted in two cities: Metropolitan Dhaka (comprising parts of Dhaka, Gazipur and Narayangonj districts) and Mymensingh. Metropolitan Dhaka is the capital city of Bangladesh and represents a good combination of heterogeneous classes of urban

people with different local culture especially in terms of food consumption behaviour and socio-economic conditions. On the other hand, Mymensingh is a very old town and an ideal representation of typical medium-sized towns in Bangladesh.

Data collection involved three stages. First, as Bangladesh currently does not have official grades and standards for meat and raw milk, it was necessary to get a preliminary idea about the attributes that consumers generally considered when differentiating quality and safety of meat and milk products. This information was used to frame questions in the questionnaire survey. Thus, a PRA was conducted among a few urban consumers at residences, restaurants or market places to understand their choice of attributes to differentiate quality and safety of selected meat and milk products, especially beef, goat meat, fresh milk and pasteurized milk. Second, a survey was conducted to understand general consumption patterns, with a focus on animal products and preference ratings of different products based on a number of product attributes. These attributes were identified during the PRA. Third, a survey was conducted on a subsample of the general consumer survey to collect data for conjoint analysis of product profile choices for beef, goat meat, fresh milk and pasteurized milk.

PRA on consumer choice of quality and safety attributes

In order to design the consumer survey questionnaire, questions on quality and safety of meat and dairy products and possible ways of quantifying consumer perceptions on these had to be determined. The Bangladesh Standards and Testing Institute has defined standards for quality and safety of some food products, including processed dairy products like pasteurized and powdered milk. However, there are no officially defined standards for most fresh food products produced and marketed in the country; it is generally believed that consumers use local informal standards based on specific criteria and indicators to differentiate quality and safety attributes of such products, and market actors and producers respond based on those attributes and consumer preferences.

In the absence of any literature on such criteria and indicators in the Bangladesh context, a rapid appraisal was conducted among 10 consumers at residences, markets, shops and eating places; 10 traders in city wet markets and shops; and 4 supermarkets in Dhaka and Mymensingh to obtain their opinions on the criteria and indicators that they normally consider when assessing the quality and safety of various dairy and meat products. No prior definition of quality and safety was provided and no indication was given about the possible differences between quality and safety criteria and their indicators. The interviewees were free to define or make their own assumptions about quality and safety criteria. The reported criteria and indicators for the selected products are summarized in Table 3.1. The results indicate that the distinction between quality and safety was not always very clear in the

minds of most respondents. This is reflected in the fact that some criteria may be associated with quality (e.g. fat content or flavour) and others with safety (e.g. purity/adulteration or hygiene) while some may be associated with both. Most respondents considered safety to be an essential part of quality.

Table 3.1. *Criteria and indicators of quality and safety for dairy and meat products included in the survey*

Products	Preference criteria and indicators of quality and safety*	
	Use of the product	Attributes of the product
Dairy products		
Raw fresh milk	Drinking	Fat content
Non-pasteurized milk	Mixing with tea, coffee or Milo	Colour
Packed fresh milk	Making yoghurt	Flavour
Pasteurized milk	Baking/sweets/cheese-making	Packaging
Ultra-heat treated (UHT) milk		Labelling
Full-cream powder milk		Taste
Half-cream powder milk		Nutritive value
Skimmed milk		Purity/adulteration
Condensed milk		Health risk
Fermented milk		Hygiene
Lassi		Shelf life
Yoghurt		Availability
Cheese		Handling convenience
Butter		Brand
Ghee		Price
Cream		Breed of animal
Ice cream		Source of product
Sweets		Vitamin-enriched or not
Chocolate milk		
Meat and eggs		Fat content
Beef		Cut
Buffalo meat		Colour
Goat meat		Appearance
Sheep meat		Display location
Chicken		Certification by heath authority
Local hen egg		Breed of animal/bird
Commercial hen egg		Sex and age
Duck egg		Production system

*Not all criteria and indicators were applicable to all the selected products. For example, if a product was not likely to be used for drinking or making cheese, it would not be rated for those criteria.

Thus, perceptions of urban Bangladeshi consumers represented both objective and subjective dimensions of quality as described in the literature (Grunert 2005). Objective quality refers to the physical characteristics (e.g. fat content) built into the product. Subjective quality is the quality as perceived by consumers. It is viewed from two approaches: (1) the holistic approach, which equates quality with all the desirable properties a product is perceived to have and (2) the excellence approach, which suggests that products can have desirable properties that consumers, in their own language, may not view as part of quality due to lack of awareness, e.g. status of growth hormone or antibiotic residues (Olsen 2002). In the holistic approach, food safety is part of food quality, at least to the extent that consumers believe food safety to be a desirable property. However, qualitative studies on food quality perception suggest that safety may not be uppermost in consumers' minds when they are asked to describe their own view of food quality (Brunso et al. 2002). This may imply that perceptions of food safety affect consumer food choice in ways that differ from perceptions of the other dimensions of quality. Thus, the relationship between the objective and the subjective dimensions is at the core of the economic importance of quality. It is only when producers can translate consumer wishes into physical product characteristics, and only when consumers can then infer desired qualities from the way the product has been built that quality will be a factor for competition among food producers (Grunert 2005).

The PRA revealed that even in the absence of scientifically-based official standards, consumers have devised ways to identify the quality and safety attributes of a product. The PRA did not establish the relative importance of all the attributes identified by the respondents. However, based on the most frequently mentioned attributes, a short list of four to five of the most important ones were identified for the major livestock commodities (see the section on Survey for conjoint analysis).

Detailed consumer survey

A sampling framework was developed in consultation with the Bangladesh Bureau of Statistics (BBS), the central statistical agency of the Bangladesh Government that conducts countrywide census and sample surveys on various issues. The BBS has already developed a good sampling framework, known as the Sample Vital Registration System, which was introduced in 1980 to determine annual inter-censal population changes. It initially covered 103 primary sample units (PSUs) each comprising about 250 compact contiguous households with permanent residence. Its scope was limited to recording births and deaths. Since then, the scope of the survey has been expanded several times by including various other parameters and increasing the number of PSUs to cover wider areas. An integrated multi-stage sample design was introduced from July 2000 with 1000 PSUs distributed between urban and rural areas throughout the country.

Currently there are 26 PSUs in Metropolitan Dhaka and 10 in Mymensingh. Considering the diversity of settlement patterns and household economic status across the defined PSUs, 12 were purposively sampled from Metropolitan Dhaka and 6 from Mymensingh. The sampled PSUs in Metropolitan Dhaka were located in seven *thanas* (police stations), namely, Badda, Demra, Dhanmondi, Gazipur, Mirpur, Mohammadpur and Narayangonj. These PSUs represent a cross-section of Dhaka city, and a cross-section of income groups is represented in each PSU. The sampled PSUs of Mymensingh were located in Kotwali *thana*. However, because purposive sampling was used, the lowest income households who live in shanty towns or slums in both cities are, to some extent, under-represented in the sample. For those households, concern about quality of animal products is perhaps less important as they consume small quantities of such products. This aspect should be taken into account while interpreting the results, especially those on average household budget shares and related information.

From each of the sampled PSUs, 50 households were randomly selected for the survey. Thus, a total of 600 samples were drawn from Metropolitan Dhaka and 300 from Mymensingh. Sampling with replacement technique was adopted to handle the problem of missing households. A detailed survey on consumption patterns was conducted during May to June 2006. The questionnaire collected information on household characteristics; preference rating for various dairy and meat products according to uses and attributes of the products; detailed expenditure on dairy and meat products and semi-aggregate expenditure on other food and non-food items; and an aggregate estimate of overall household income and expenditure. Because consumers did not clearly distinguish between quality and safety during the PRA, such distinction was also avoided during the detailed survey. Instead, based on a synthesis of the various opinions on quality and safety criteria expressed during the PRA, a set of criteria and related indicators were chosen for inclusion in the detailed survey to solicit information on consumer preferences for each product in relation to the chosen criteria and indicators.

Survey for conjoint analysis

Preliminary analysis of the detailed consumer survey revealed that beef, goat meat, chicken, fresh milk and pasteurized milk were the most important products consumed by majority of the consumers. Conjoint analysis was used for beef, goat meat, fresh milk and pasteurized milk because for these products, consumers considered several attributes when judging product quality and safety. In the case of chicken, preference rating suggested that the only important attributes were breed (local slightly preferred to exotic) and type of bird (young birds highly preferred to cockerels or hens).

In order to undertake conjoint analysis, it was necessary to create profiles of each of the four products composed of selected attributes and attribute levels, and ask respondents to

evaluate and rank the profiles. An attribute is a general product characteristic (such as fat content) while an attribute level is a specific value of the attribute (such as high, low or some specific value of a currency).

During the consumer survey, respondents were not directly asked to rank criteria and indicators of quality and safety of different products that they purchased. However, preliminary analysis of the responses on preference ratings of products based on different uses and attributes provided some indication of the most important criteria and indicators of quality and safety that the respondents used in their buying decisions. These were combined with the PRA results to develop a short list of criteria for designing a supplementary survey. Accordingly, four attributes of beef (breed, sex, fat content and price) were chosen, the first three of which had two levels each while the fourth had three levels. For goat meat, sex, fat content and freshness had two levels each and price had three. For raw milk, breed, fat content and purity had two levels each and price had three. For pasteurized milk, fat content and packaging had two levels each and price had three.[2]

Taking all the attributes and levels, a large number of profiles would emerge in a full factorial design for each product; this would be impossible to implement as respondents would be unable to compare so many profiles. Therefore, the orthogonal design of SPSS conjoint procedure (SPSS 2005) was used to select 12 profiles (the first 8 are design and last 4 are hold-outs) out of all possible combinations for each of the 4 products (Tables 3.2 to 3.5).

Table 3.2. *Conjoint orthogonal design for beef in Dhaka and Mymensingh*

Profile	Breed	Type	Fat content	Price (BDT/kg)
1	Indian	Bull	High	190
2	Indian	Cow	Low	170
3	Local	Cow	Low	190
4	Local	Bull	Low	170
5	Local	Bull	High	170
6	Indian	Bull	Low	180
7	Indian	Cow	High	170
8	Local	Cow	High	180
9	Indian	Bull	High	170
10	Local	Cow	High	170
11	Local	Bull	Low	180
12	Local	Bull	Low	190

The three levels of price were low (BDT 170), medium (BDT 180) and high (BDT 190).

---

2. In the case of pasteurized milk, brand could have been included as an attribute but consumers in Mymensingh did not have access to different brands as widely and easily as those in Dhaka at the time of the survey, so the overall responses would have been unbalanced. Hence, the attribute 'brand' was not included in the profile of pasteurized milk.

Table 3.3. *Conjoint orthogonal design for goat meat in Dhaka and Mymensingh*

Profile	Sex	Fat content	Freshness	Price (BDT/kg)
1	Male	High	Fresh with blood	250
2	Female	High	Water added	230
3	Male	Low	Water added	230
4	Male	Low	Fresh with blood	230
5	Female	Low	Fresh with blood	240
6	Female	High	Fresh with blood	230
7	Female	Low	Water added	250
8	Male	High	Water added	240
9	Female	High	Water added	240
10	Female	High	Fresh with blood	240
11	Male	Low	Water added	250
12	Male	Low	Water added	240

The three levels of price were low (BDT 230), medium (BDT 240) and high (BDT 250).

Table 3.4. *Conjoint orthogonal design for raw milk in Dhaka and Mymensingh*

Profile	Breed	Fat content	Purity	Price (BDT/litre)
1	Cross	High	Pure	27
2	Cross	Low	Water added	33
3	Local	High	Water added	27
4	Local	Low	Water added	27
5	Cross	Low	Pure	27
6	Cross	High	Water added	30
7	Local	High	Pure	33
8	Local	Low	Pure	30
9	Cross	Low	Pure	33
10	Local	Low	Pure	27
11	Local	High	Pure	30
12	Cross	High	Pure	33

The three levels of price were low (BDT 27), medium (BDT 30) and high (BDT 33).

Table 3.5. *Conjoint orthogonal design for pasteurized milk in Dhaka and Mymensingh*

Profile	Fat content	Packing	Price (BDT/litre)
1	Full cream	Polypack	38
2	Low	Polypack	35
3	Full cream	Paper carton	35
4	Low	Polypack	32
5	Full cream	Polypack	32
6	Full cream	Paper carton	32
7	Low	Paper carton	32
8	Low	Paper carton	38
9	Low	Paper carton	35
10	Full cream	Paper carton	38
11	Full cream	Polypack	38
12	Low	Polypack	38

The three levels of price were low (BDT 32), medium (BDT 35) and high (BDT 38).

A structured questionnaire was developed based on each of the product profile tables for beef, goat meat, and raw and pasteurized milk. A conjoint card was prepared for each product profile, with colour pictures used to depict the various levels of the attributes. This approach made it easy to transfer the ideas of each product profile for explanation to the respondents which in turn improved the quality of the data collected. Since other data on respondent characteristics and consumption patterns were collected during a previously conducted consumption survey, this survey focused only on the product profile data.

Survey data were collected in June 2007 from a subsample of 380 households (42% of the original 900): 260 households in Dhaka and 120 in Mymensingh. This was assumed to be adequate to obtain reliable estimates. A sample size of 300–500 is typical in commercial conjoint studies (Cattin and Wittink 1982).

Special care was taken to collect accurate data on the product profile scoring. To prevent mistakes like overvaluation of attributes presented in the upper part of the profile cards, all the attributes and their corresponding levels, and the meaning of the ratings were first explained to the respondents. The enumerators began by explaining the meaning of the levels of the attributes represented by one product and the meaning of the corresponding ratings. The respondents were then asked to explain their understanding of the levels of the attributes and the ratings. This procedure was repeated in turn for each product, a process which took 15–30 minutes. These preliminary explanations were necessary to ensure that the attribute names provided the information that was intended in the survey. Once the explanation procedure was completed, the respondents were presented with 12 product profile cards without any order and asked to rate the profiles on a scale of 1 (least preferred) to 10 (most preferred). This rating procedure was repeated for the remaining three products.

Results and discussion

Relative importance of attributes or part worth of beef and goat meat

In estimating part worth by employing conjoint procedure in SPSS 16, the levels of attributes were entered in the data set using effect coding, whereby binary variables (such as breed or sex) were assigned 0 or 1, respectively, and variables with three levels (such as low, medium and high price) were respectively coded as –1, 0 and 1. The direction of consumer preference for a particular attribute in the model was modelled as discrete (direction of preference was not hypothesized), or linear more or linear less (higher or lower utility for presence of preferred conditions). The price of beef was coded as –1 for high price, 0 for medium price and 1 for low price, and it was modelled as linear less which means the utility that the consumers would get decreased as the beef price increased. In interpreting the part worth values, it is necessary to note that the absolute values of the part worth of the attributes

do not have any economic meaning, as we are interested in ordinal utility. Hence, what is important is the ordering of the values; higher values indicate higher utility while lower values indicate lower utility (Louviere et al. 2005). Note that assuming more or less will not have any effect on the calculation but SPSS will indicate the inconsistency of the assumption through generating reversals. An increase in the number of reversals indicates that the assumptions made are wrong.

For beef and goat meat, several alternative specifications were estimated with combinations of 'discrete' and 'linear less' outcomes for different factor levels. Estimated part worth and related statistics for the best specifications based on test statistics and percentage reversals are shown in Table 3.6. The results are statistically reliable as both Pearson's R and Kendall's tau statistics are highly significant at a probability of less than 1%. The estimated number of reversals is relatively small except for price in the case of goat meat, indicating that the assumptions made with respect to different attributes about the direction of consumer preference were reasonably consistent.

Table 3.6. *Estimated part worth or utility of quality and safety attributes of beef and goat meat for sample households in Dhaka and Mymensingh*

Attributes	Beef		Goat meat	
	Attribute level	Coefficient	Attribute level	Coefficient
Sex	Cow	0.000 (0.000)	Female	0.000 (0.000)
	Bull	1.526 (0.290)	Male	1.157 (0.366)
Breed	Indian	0.000 (0.000)	na	
	Local	0.910 (0.290)	na	
Freshness	na		Water added	0.000 (0.000)
	na		Fresh with blood	1.037 (0.366)
Fat content	High	0.000 (0.000)	High	−0.523 (0.183)
	Low	1.053 (0.290)	Low	0.523 (0.183)
Price (BDT/kg)	170	0.340 (0.187)	230	0.209 (0.221)
	180	0.000 (0.000)	240	0.000 (0.000)
	190	−0.340 (0.187)	250	−0.209 (0.221)
Constant		4.421(0.313)		4.963 (0.322)
Pearson's R		0.970***		0.949***
Kendall's tau		1.000***		0.764***
Kendall's tau for hold-outs		0.667***		1.000***
Reversals	Sex	17%	Fat	10%
	Breed	5%	Sex	13%
	Fat	12%	Price	33%
	Price	23%		

Note: For beef, levels of all attributes except price were modelled as linear more; price was modelled as linear less. For goat meat, fat content levels were modelled as discrete, sex and freshness as linear more and price as linear less.
Standard errors in parentheses. na = not applicable.
*** Significant at less than 1% level.
Source: Field survey.

In the case of beef, the part worth of sex, breed and fat content indicated that consumers had a strong preference for beef from bulls rather than cows, from local nondescript cattle breeds rather than Indian breeds, and with low rather than high fat content. Conversely, they derived less utility from meat from cows, Indian breeds and high-fat carcasses. The reason for lower preference for cow meat is that old culled cows are generally slaughtered so the quality of meat is not perceived to be good. This does not apply if meat is derived from a heifer, for example, but in the product profile the choice was limited to mature animals. Preference for local breeds also emanates from the perception that meat of local breeds is generally soft with fine fibre while that of Indian breeds becomes tough partly due to the older age at which they are sold for slaughter and partly due to long trekking from faraway places to the Bangladesh market. The part worth of price was lower for high price and higher for low price as expected but the coefficients have fairly small values with relatively high standard errors. There are reversals in 23% of the subjects or samples, so the preferences between price levels do not appear to be very strong relative to other factors.

With respect to price, the above results may imply three things. First, the 12% price difference between the low and the high price (BDT 170 vs. BDT 190) included in the product profile options was not sufficiently large to capture any strong preference due to price. Second, consumers probably do not worry too much about a reasonable difference in price, provided their preference for other attributes such as sex, breed and fat content of beef are met. Third, most consumers buy a mixture of cuts along with bone to make good curry. However, in order to maximize net profit from a carcass, traditional butchers add a disproportionate amount of bone, solid fat and low quality meat in each unit of sale, irrespective of the main portion of the carcass chosen by the customer. Consumers who try to avoid consuming fat usually remove solid fat from the meat before cooking it and may also have to discard some portion of the low quality meat. Hence, the net or real price per unit of meat becomes higher than the nominal price paid at the time of purchase, although such possibilities were not adequately captured by the price options included in the product profiles.

In the case of goat meat, the part worth estimates for sex, freshness and fat content indicated that consumers had strong preference for low-fat meat from male animals that is obtained from a fresh carcass rather than meat that has been soaked in water. The part worth of price for goat meat had the same pattern as that of the price of beef, primarily for the same reasons.

The lower part worth of both beef and goat meat with high fat content is explained by the fact that these meat products are among the few sources of daily dietary fat for urban consumers. However, as incomes rise and awareness about nutrition increases, the richer segment of the population may consume fat from a variety of sources and hence would be more sensitive

to the level of fat in meat due to health reasons. This is reflected in the consumer rating of production system, meat cuts and fat content. In supermarkets, meat cuts with or without fat can be bought as required. Despite this general behaviour, it was observed that on the occasion of major festivals like *Eid ul Adha* when live animals are bought for own slaughter, people generally prefer to buy large, healthy and fat animals, though after slaughter the extra fat may be removed from the meat before cooking.

Regarding the weighting of purchase decisions on beef, other things being equal, the average buyer gave 33% weight to the breed of cattle, 27% to fat content of the meat, 21% to sex of the animal and 19% to price. In the case of purchase decisions on goat meat, sex, freshness, fat content and price were given respective weights of 30%, 27%, 26% and 17%. The least weight given to price in the case of both beef and goat meat was consistent with the low part worth of price levels discussed earlier.

Relative importance of attributes or part worth of raw and pasteurized milk

Table 3.7 shows the estimated part worth and related statistics for the best specifications for raw and pasteurized milk based on test statistics and percentage reversals. The results are statistically reliable as both Pearson's R and Kendall's tau statistics were highly significant at a probability of less than 1%. The estimated number of reversals is relatively small except for price of raw milk, indicating that the assumptions made with respect to different attributes about the direction of consumer preference were reasonably consistent.

Buyers of raw fresh milk appeared to be fairly indifferent to fat content and to have marginally higher preference for milk from local breeds rather than crossbreeds but strong preference for milk that had not been adulterated with added water. Low price was also strongly preferred to high price, an indication that consumers did not necessarily associate high price with higher quality, given that several other attributes such as breed of cow and adulteration of milk were not easily verifiable at the point of purchase. The preference for milk from local breeds was consistent with preference ratings given to local animals compared to crossbreeds. Addition of water is the most common form of adulteration of milk in Bangladesh. Consumers perceive that addition of water has two potentially negative effects on milk quality, namely, it may make the milk 'impure' or 'unsafe' if the water is contaminated and it dilutes the milk thereby reducing its fat content. Therefore, the preference for fat content is partly indirectly expressed through preference for milk without added water. There are other forms of adulteration such as addition of powdered milk or chemicals but ordinary consumers cannot easily verify these at the time of purchase to make a choice.

Table 3.7. *Estimated part worth or utility of raw and pasteurized milk quality and safety attributes for sample households in Dhaka and Mymensingh*

Attributes	Raw milk		Pasteurized milk	
	Attribute levels	Coefficient	Attribute levels	Coefficient
Fat	Low fat	0.173 (0.105)	Low fat	−0.017 (0.091)
	High fat	−0.173 (0.105)	Full fat	0.017 (0.091)
Breed	Cross	−0.275 (0.105)	na	
	Local	0.275 (0.105)		
Purity	Water added	0.000 (0.000)	na	
	Water not added	0.853 (0.210)		
Packing			Paper carton	−0.412 (0.091)
			Polypack	0.412 (0.091)
Price (BDT/litre)	27	0.494 (0.127)	32	0.912 (0.110)
	30	0.000 (0.000)	35	0.000 (0.000)
	33	−0.494 (0.127)	38	−0.912 (0.110)
Constant		5.710 (0.152)		6.356 (0.096)
Pearson's R		0.965***		0.978***
Kendall's tau		0.857***		0.857***
Kendall's tau for hold-outs		1.000***		1.000***
Reversals	Price	20%	Purity	6%
	Purity	15%		

Note: For raw milk, factor levels for purity were modelled as linear more, price as linear less and breed and fat content as discrete. For pasteurized milk, factor levels for price were modelled as linear less and for fat content and packing as discrete.
*** Significant at 1%.
Standard errors in parentheses. na = not applicable.
Source: Field survey.

Buyers of pasteurized milk were also indifferent to fat content but had strong preference for milk that was packaged in polypacks rather than paper cartons, and for low price. However, if buyers carefully check the product specifications on the packs, especially when these are of similar nature, they will find that some brands of low-fat milk are ultra-heat treated (UHT) rather than pasteurized, hence the difference is more easily observable. Some consumers prefer lower fat so they buy full-fat milk then remove some fat after boiling the milk.

Among the selected attributes of raw fresh milk, other things being equal, in the purchase decision the average buyer gave 31% weight to price, 28% to water adulteration, 22% to breed of the cow and 19% to fat content. In the case of pasteurized milk, among the three selected attributes, 49% of weight was given to price, 30% to packing and 21% to fat content.

The sampled consumers considered fat content to be the least important factor in determining product quality and safety during recent purchases of raw fresh milk; instead, they gave the highest consideration to freshness followed by taste and purity. In the case of pasteurized milk, taste was the most important factor and fat content the least important.

Overall preference rating of different product profiles

Assuming that utility from different attributes is additive, the results in Tables 3.6 and 3.7 can be used to estimate the total utility one would get from consuming a product of a certain profile. Accordingly, other things being equal, the most preferred beef profile was profile 4, namely, 'low-priced, low-fat beef from local bulls' while the least preferred was profile 7, namely, 'low-priced, high-fat beef from Indian cows'. The most preferred goat meat profile was profile 4, or, goat meat that was 'low-priced, low-fat, fresh with blood and from a male animal' while the least preferred was profile 9, or, goat meat that is 'medium-priced, with high-fat, from a female animal, and has added water' (Table 3.8).

Table 3.8. *Estimated total utility of the 12 profiles for beef, goat meat, raw milk and pasteurized milk as rated by consumers*

Product profile*	Beef	Goat meat	Raw milk	Pasteurized milk
1	−1.18	1.57	0.89	0.48
2	−0.34	−0.31	−0.60	0.39
3	0.19	1.89	0.60	−0.39
4	2.08	3.03	1.54	1.30
5	1.02	1.66	1.23	1.34
6	0.22	0.83	0.45	0.52
7	−1.40	0.31	0.47	0.48
8	−0.22	0.64	1.30	−1.34
9	−0.56	−0.52	0.25	−0.43
10	0.12	0.62	1.79	−1.30
11	1.74	1.47	0.96	0.43
12	0.34	1.68	−0.09	0.52

*See Tables 3.2 to 3.5 for characteristics of the profiles for each product.
Source: Field survey.

For raw milk, other things being equal, the most preferred profile was profile 10, namely, 'low-priced, low-fat, unadulterated milk from a local cow' while the least preferred was profile 2, namely, 'high-priced, low-fat, adulterated milk from a crossbred cow' (Table 3.8). In the case of pasteurized milk, the most preferred profile was profile 5, namely, 'low-priced, full-cream milk in a polypack' and the least preferred was profile 8, namely, 'high-priced, low-fat milk in a paper carton'. The utilities or preferences for other profiles of each product lie within these extremes.

In the profiles of beef and pasteurized milk, there are attributes that are strongly liked or disliked, as indicated by an even distribution of profiles with positive and negative utilities. On the other hand, in the profiles of raw milk and goat meat, there are few cases of extreme dislike of attributes, as indicated by few profiles with negative utilities.

OLS regression was used to identify socio-economic variables or respondent characteristics—in addition to product attributes—as determinants of preference ratings for quality and safety attributes of each product. However, only expenditure level (as a proxy of income) was the statistically significant factor in the equations for beef, goat meat and raw milk (richer respondents gave higher ratings), education was significant in the equation for goat meat (richer respondents gave lower ratings) and religion was significant in the equation for raw milk (Muslim respondents gave higher ratings). Therefore, details of the regression equation specification and results are not shown here.

Summary and conclusions

Summary

There are no official grades or standards for beef and goat meat in the domestic market in Bangladesh. For raw milk, there are no officially defined grades or standards except that adulteration with water is illegal. In the case of pasteurized milk, officially defined standards exist for fat content; no other quality and safety indicators are defined though the packaging of processed products is labelled with the product contents. A rapid appraisal among consumers revealed that they use certain criteria to define the quality and safety of beef, goat meat, raw milk and pasteurized milk and have specific preferences for the profiles of these products based on these criteria. However, a clear distinction between quality and safety is not always made as some attributes are thought to reflect both quality and safety. For example, raw milk that is not adulterated with water is generally perceived as being safer and of superior quality because buyers are generally apprehensive about the source of water that may be added to raw milk.

A detailed survey was conducted in 2006 in Dhaka and Mymensingh among 900 households selected through a multi-stage stratified sampling procedure to obtain information on consumer preferences expressed through rating of dairy products, meat and eggs, according to their alternative uses and attributes that reflect quality and safety. In order to undertake conjoint analysis to determine profiles of products preferred by consumers, a supplementary survey was conducted on a subsample of 380 households, focusing on beef, goat meat, raw milk and pasteurized milk. In each case, orthogonal design of SPSS was used to select 12 product profiles based on a combination of selected factors and their respective levels. For beef, the factors and levels considered were breed (Indian, local), sex (bull, cow), fat content (high, low) and price (low, medium, high). For goat meat, the factors and levels considered were sex (male, female), freshness (fresh with blood, water added), fat content (high, low) and price (low, medium, high). For raw milk, the factors and levels considered were breed (local, cross), fat content (low, high), purity (water added, water not added) and price (low,

medium, high). For pasteurized milk, the factors and levels considered were fat content (low, full cream), packaging (polypack, paper carton) and price (low, medium, high).

Results of conjoint analysis showed that, other things being equal, the most preferred beef profile was 'low-priced, low-fat meat from a local bull' while the least preferred was 'low-priced, high-fat meat from an Indian cow'. The most preferred goat meat profile was meat that was 'low-priced, low-fat, fresh (no added water) and from a male animal' while the least preferred was meat that was 'medium-priced, high-fat, from a female animal, and has added water'. In the weighting of purchase decisions on beef, other things being equal, the average buyer gave 33% weight to the breed of the animal, 27% to fat content of the meat, 22% to sex of the animal and 19% to price. In the case of purchase decisions on goat meat, sex, freshness, fat content and price were given respective weights of 30%, 27%, 26% and 17%. The least weight given to price in the case of both beef and goat meat was consistent with the low part worth of price levels discussed earlier.

Other things being equal, the most preferred profile of raw milk was 'low-priced, low-fat, unadulterated milk from a local cow' while the least preferred was 'high-priced, low-fat, adulterated milk from a crossbred cow'. For pasteurized milk, the most preferred profile was 'low-priced, full-cream milk in a polypack' and the least preferred was 'high-priced, low-fat milk in a paper carton'. Consumers considered fat content to be the least important factor for determining the quality and safety of recently purchased raw milk, but gave the highest consideration to freshness followed by taste and purity. In the case of pasteurized milk, taste was the most important criterion and fat content the least important.

Conclusions

Two sets of conclusions can be drawn from the results of this study. One is related to demand for quality and safety in animal products and its implications. The other is related to the methodology for empirical investigation of demand for quality and safety in market conditions where officially defined grades and standards may not be available.

In Bangladesh, official grades and standards for animal products are virtually non-existent or very poorly and partially defined in some cases, and they are not effectively enforced. However, consumers use specific informal criteria and indicators to differentiate the quality and safety of various animal products, and pay or are willing to pay different prices for such products. These empirically based criteria and indicators may be used as the starting point or basis to define official standards, as they represent revealed consumer preferences or demand backed by willingness to pay. In addition, more studies of a similar nature may be conducted to expand and update criteria and indicators in combination with rigorous laboratory based parameters to improve the definition of food standards. As demand for quality and safety

continue to increase in line with economic development, such periodic updating will lead to the establishment of standards that reflect both evolving consumer demand and the requirements of public health, hygiene and nutrition. Such an evolutionary approach towards developing food standards can be used as an effective demand-led mechanism to improve product quality and safety along the supply chain from producer to retailer. Complementary regulations may be formulated and enforced at the levels of producers and market intermediaries to ensure delivery of standard quality and safe products to consumers.

In many developing countries where food standards are non-existent or poorly defined and enforced, private enterprises are introducing self-regulated standards to promote their own products based on quality assurance and reputation. For example, vertically integrated enterprises respond to consumer demand by setting their own standards which they enforce through self-regulation along the supply chain. Contract farming without a vertically integrated enterprise also involves the same, though enforcement in such systems is less rigorous. Therefore, it should be possible to apply the same principles to use demand signals as a basis to improve food quality and safety along the traditional or informal marketing chains prevailing in the country. Producers will only respond to standards in their production decisions if they discover that demand and incentive prices exist for products differentiated by quality and safety.

There are methodological challenges in assessing the demand for food quality and safety in a situation where there are no official grades and standards to define the same. Capturing and interpreting consumer perceptions requires careful consideration and use of appropriate techniques. In this study, a PRA was initially conducted to identify the criteria and indicators that consumers use in differentiating quality and safety of beef, goat meat, raw milk and pasteurized milk. The information was used for a subsequent formal survey to collect quantitative data for rigorous statistical analysis. The criteria and indicators identified during the PRA were generally confirmed and complemented by more formal statistical analysis indicating that, in a situation where time and resources are limited, a carefully conducted PRA is a robust technique to assess criteria and indicators for food quality and safety. A combination of PRA and systematic detailed surveys may be regularly conducted within an evolutionary approach to develop, update and improve food standards based on local consumer demand rather than on the basis of present-day norms of developed countries which are not relevant to present-day local situations.

References

Brunso K, Fjord TA and Grunert KG. 2002. *Consumers' food choice and quality perception.* MAPP Working Paper 77. Aarhus School of Business, Aarhus, Denmark.

Cattin P and Wittink DR. 1982. Commercial use of conjoint analysis: A survey. *Journal of Marketing* 46:44–53.

Grunert KG. 2005. Food quality and safety: Consumers perception and demand. *European Review of Agricultural Economics* 32(3):369–391.

Hossain M and Deb U. 2009. Food security and containing escalation in prices: Facts and implication for policy. Paper presented at the CPD conference on development with equity and justice—Immediate tasks for the newly elected government, Dhaka, Bangladesh, 28–29 March 2009.

Lancaster K. 1971. *Consumer demand: A new approach*. Columbia University Press, New York, USA.

Louviere JJ, Eagle TC and Cohen SH. 2005. *Conjoint analysis: Methods, myths and much more*. CenSoc Working Paper No. 05–001. 65 pp.

Olsen SO. 2002. Comparative evaluation of the relationship between quality, satisfaction and repurchase loyalty. *Journal of the Academy of Marketing Science* 30:240–249.

SPSS. 2005. *Conjoint analysis: Syntax reference guide*. SPSS Inc., USA.

Chapter 4   Assessing consumer preferences for quality and safety attributes of food in the absence of official standards: The case of beef, raw milk and local butter in Ethiopia

Mohammad A Jabbar[1] and Samuel Amare Admassu[2]

1. mjabbar2@gmail.com; was a senior agricultural economist at the International Livestock Research Institute (ILRI), Addis Ababa, Ethiopia and is currently a consultant agricultural economist in Dhaka, Bangladesh

2. s.amare@cgiar.org; senior research assistant at ILRI, Addis Ababa, Ethiopia

Abstract

Conjoint analysis was applied to assess the part worth of beef, raw milk and local butter quality and safety attributes using cross-sectional data collected in June 2007 from a stratified sample of 300 households in Addis Ababa, Ethiopia. Due to the absence of official standards for quality and safety in the domestic market for livestock products, data on consumer perceptions of quality and safety attributes were derived from a participatory rapid appraisal (PRA). The data were then used to define product profiles in a detailed survey. Results show that freshness, abattoir stamp, fat content, hygiene of meat shop and staff, and price were the main quality and safety attributes that consumers used, in the order mentioned, in their purchase decisions when buying beef. In the case of raw milk, significant attributes (ranked from most to least important) were hygiene, smell, adulteration, price and fat content, while for local butter these were purity, hygiene, freshness, price and origin. There was a difference in rating of attributes across income groups and among attributes. In the case of beef, freshness was most important for low income households while fat content was most important for high income households. Abattoir stamp was less important for low income households but very important for high income households. Hygiene was rated high by the higher income households and low by lower income households. In the case of local butter and raw milk, the order of importance of the various attributes was similar. However, only in the case of milk was the weight given to hygiene by high income households much higher than other groups. Otherwise, differences among income groups were less pronounced compared to beef. Price was not an important attribute for quality and safety for the entire sample as well as for different income groups. The results of the study could be used to design safety and quality standards for local 'wet' markets and gradually revise such standards as more empirical information on changing consumer demand for quality and safety becomes available. Further, the consistency of results between the PRA and the detailed survey indicates that a carefully designed PRA could be a useful tool to generate

information on consumer behaviour and preference in the face of time and resource constraints.

Key words: beef, raw milk, local butter, quality and safety attributes, conjoint analysis, Ethiopia

Introduction

Demand for meat and dairy products has been increasing rapidly in developing countries, propelled by income and population growth and urbanization. It is also observed that consumer demand for reliable quality, food safety and scale of delivery has been increasing, especially in urban areas. A manifestation of this is the price premium in formal markets (supermarkets and other such outlets) for similar products sold in traditional wet markets. For the same reason, some higher income and expatriate consumers prefer to buy imported products whenever available (Reardon et al. 2003). Official standards for quality and safety of food products like meat and milk either do not exist or may have been defined according to developed-country norms thereby limiting their relevance and the extent to which they can be enforced in a developing-country context. In such situations, local standards are often used in both formal and informal markets where consumers and suppliers use certain criteria and indicators to differentiate product qualities and standards.

The literature cites two aspects of food quality: objective and subjective quality (Grunert 2005). Objective quality refers to the physical characteristics built into the product, such as fat content and freshness, while subjective quality refers to quality as perceived by consumers. In the subjective realm, there are two approaches to quality. The first—the holistic approach—equates quality with all the desirable properties a product is perceived to have. The second—the excellence approach—suggests that products can have desirable properties that consumers, in their own language, may not view as part of quality. For example, consumers may say that 'convenience goods are generally of low quality', even though they regard convenience as a desirable property of food products (Zeithaml 1998; Olsen 2002).

It follows from the holistic approach that food safety is part of food quality, at least to the extent that consumers believe food safety to be a desirable property. However, qualitative studies on food quality perception suggest that safety may not be uppermost in consumers' minds when they are asked to describe their own view of food quality (Brunso et al. 2002). This may suggest that perceptions of food safety affect consumer food choice in ways that are different from perceptions of the other dimensions of quality. It seems that safety perceptions play a role predominantly in two ways. First, in situations where major safety problems are perceived—such as during outbreaks of mad cow disease and avian influenza—risk perceptions can come to dominate all other considerations in food choice and lead consumers to avoid certain categories or brands for some time, until the situation has returned to normal (Burton and Young 1996). Such safety perceptions do not enter into quality perceptions under normal circumstances, but can have sweeping effects at times of crisis. Second, consumers apply safety considerations to certain production technologies and perceive the use of certain production techniques, such as hormone-induced fattening

of beef, as unsafe and develop negative attitudes towards the use of these technologies. Such attitudes can be powerful forces in the marketplace, which both industry and regulators take seriously (Bredahl 2001; Burton et al. 2001; Grunert et al. 2003). The relationship between the objective and subjective dimensions is at the core of the economic importance of quality. It is only when producers can translate consumer wishes into physical product characteristics, and only when consumers can then infer desired qualities from the way the product has been built that quality will be a factor for competition among food producers (Grunert 2005).

However, most of the existing literature on demand with a focus on quality and safety deals with developed-country markets (for an extensive review of the literature, see Grunert 2005). Conversely, studies pertinent to local standards and how these are defined and implemented along market chains from producers to consumers in developing-country markets are rather scarce. Supermarkets are expanding rapidly with demand for higher quality products which are mainly supplied by large-scale farms and processors and imports. Small- and medium-scale producers and market actors that supply them find it difficult to penetrate the niche markets because they often are unaware about or fail to meet the safety, quality and quantity of products demanded.

An understanding of which segment of the market prefers which quality and safety attributes and whether consumers are willing to pay for such preferences is essential for market actors and producers to be able to respond to those preferences. Also, understanding these attributes and their price premiums may provide a basis for defining and standardizing local grades and standards. Such information will help refine any existing standards that are defined on the basis of developed-country norms. Such standards can be gradually revised as the economy grows and consumers increase their expectations, and as additional empirical data are collected.

The objective of this paper is to identify quality and safety criteria and indicators for beef, raw milk and local butter as perceived and used by consumers in Addis Ababa, Ethiopia in order to assess the relative importance of different attributes and consumers' willingness to pay for such attributes. It is hypothesized that in the absence of official standards, informal standards for quality and safety of these products do exist; consumers have good perceptions about informal quality and safety attributes and this is revealed through price differentials. In the following sections, the methodology including details on sampling, data collection and analytical approach are discussed; and the results and discussions are presented. Concluding remarks are presented at the end of the paper.

Methodology

Conjoint analysis of preference rating of quality and safety attributes

Conjoint analysis has been used extensively by marketing firms to evaluate potential attributes of new products and to determine the optimal mixture of multilevel attributes included in those products (for a review, see Louviere et al. 2005). Conjoint analysis was used in this study to assess the relative importance to consumers of different attributes of beef, raw milk and local butter.

Conjoint analysis is derived from Lancaster's theory of demand which posits that the utility an individual will derive from consuming a given product is a function of the characteristics of the product (Lancaster 1971). It is further assumed that when a consumer makes a decision about such a product, the decision is based on trade-offs among these characteristics. The purpose of a conjoint analysis is to estimate utility scores, called part worth, for the characteristics. Utility scores are measures of how important each characteristic is to the respondent's overall preference of a product (Louviere et al. 2005).

In order to estimate the relative importance of different attributes of a product, it is necessary to create product profiles composed of selected attributes and attribute levels, and ask respondents to rate, rank or evaluate the product profiles. The attributes are the general characteristics of a product—such as fat content, colour and price—while attribute levels are specific values of the attribute of a particular product—such as high, low or some specific value of a currency. The virtue of conjoint analysis is that it asks the respondents to make choices in the same fashion as the consumer presumably does by trading off between features or attributes, one against another (SPSS 2005).

Data source

PRA to identify the most important quality and safety attributes of beef, raw milk and local butter

In Ethiopia, the majority Orthodox Christian population observes a large number of fasting days, including two designated days per week throughout the year and longer periods during Easter and Christmas, when intake of animal products of all kinds and slaughter of animals for meat are avoided. Consequently, during the fasting periods raw milk is converted into local butter which keeps better. Local butter has been traditionally used for cooking instead of cooking oil. However, this practice has declined with increasing number of poor people having no dairy animals and with increasing price of local butter in the market.

This study was conducted in Addis Ababa, the capital city of Ethiopia. The study was limited to urban areas as quality and safety differentiation in animal products is more widely practised in urban areas compared to rural areas where consumption levels for these products are much lower and choices are limited.

In developed countries, there are official food standards, brands, labelling and other information which consumers may use in differentiating quality and safety, and in purchase decisions. In Ethiopia, as in other developing countries, non-standardized beef, raw milk and fresh local butter are sold in the domestic market due to the absence of official standards, though standards exist for processed products such as pasteurized milk and products destined for export. Therefore, it was not possible to relate consumers' perceptions about formal grades or standards that reflect quality and safety of raw products with the willingness to pay for such standards. Rather, it was necessary to first establish from consumers what attributes they perceived as important in differentiating quality and safety of beef, raw milk and local butter, their perceptions about the indicators or levels of those attributes, and their willingness to pay for those attributes and levels. To this end, a PRA was conducted among 200 consumers to get a quick overview of their perceptions on quality and safety of these products. They were briefly interviewed at random at homes, shops, eating places and supermarkets. Efforts were made to cover a wide variety of consumers in terms of income and socio-religious characteristics. Interviews were conducted without giving the respondents any *a priori* definition or meaning of 'quality' or 'safety'; rather, the meanings were left open for the respondents to define or interpret. The purpose was to see how their perceptions matched with the standard concepts of food quality and safety.

The most important attributes to define quality of beef as perceived by most of the sampled consumers were fat content and freshness, and the attributes to define safety of beef were official abattoir stamp and standard of hygiene of sales outlet and staff. Price was perceived as an attribute of both quality and safety.

The quality perception about meat in terms of fat content differed from person to person depending on preferences. Some said fatty meat was of high quality while others said low-fat red meat was of superior quality. As a result, there was a difference in quality perception about different parts of the same carcass depending on individual preference for fat. Difference in quality perception in terms of fat content also varied depending on the purpose for which the meat was used. Meat used for making *kitfo* (minced beef) was preferred if it was red, tender and lean. Meat with gristles was preferred for making *wot* (sauce), while red meat with some fat was preferred for *tibbs* (fried meat).

In Addis Ababa, warm or freshly slaughtered meat is not usually sold in butcheries because slaughtering of animals outside abattoirs is prohibited except on certain festival days when

most urban households slaughter cattle or small ruminants at home individually or on a share basis. Abattoirs deliver chilled meat to butcheries which allows a slightly longer shelf life because of the mild cold weather prevalent in Addis Ababa. Additionally, some butcheries have refrigerators or cold rooms for storage. Therefore, freshness was perceived by the respondents in terms of shelf life of chilled beef and most felt that quality (and, in some cases, safety) of meat deteriorated after one or two days on the shelf if not stored in a cold room or refrigerator.

Regarding the safety of beef, respondents said that the presence of tapeworms in meat was the most important concern especially for beef eaten raw. Thus, consumers usually bought beef in outlets where the meat sold had an official stamp of the abattoir which served as an assurance of the health of the animal immediately before slaughtering. Consumers generally considered beef with an official stamp to have no or low chances of tapeworm infestation.

Respondents also considered cleanliness of the butcher and butchery as important criteria for the safety of beef. For example, meat sold in supermarkets was considered to be safer than that sold in butcheries primarily because of differences in cleanliness between the two types of sales outlets. Butchers usually placed their meat on open surfaces or trays, a practice which was not considered safe as it exposed the meat to dust and flies. Most respondents also considered the method of meat distribution from the abattoirs and the condition of the work clothes of the meat handlers to be important indicators of safety. The work clothes of the abattoir meat handlers were supposed to be clean but in reality this might not be practicable; though bloodstains may be present temporarily, work clothes would need to be regularly washed to avoid growth of harmful bacteria.

There were two opinions on price as a quality and safety attribute of beef. First, most of the respondents did not think that price was a strong indicator of quality but observed that physical characteristics were a more dependable basis for quality. Second, some respondents said that high-quality meat was usually slightly more expensive so price could also be taken as an indicator for quality. Some butcheries had high sales turnover and sold high-quality meat at high prices. In addition, the premises and staff had high standards of hygiene. Some consumers usually travelled long distances to buy beef from such butcheries. Individuals who could not afford to buy high-priced superior quality beef or those who were discouraged due inability to access such butcheries nearby went to places where the meat quality and safety was inferior. Most individuals said they would be willing to pay 10–15% more on the prevailing price of Ethiopia birr (ETB)[1] 34/kg for beef of higher quality and that was free from public health threats, e.g. tapeworms. Any guarantee by the seller would be used as a legal claim by the buyer if the seller defaulted.

---

1. Ethiopia birr (ETB). In 2009, USD 1 = ETB 12.7.

The quality and safety criteria of raw milk identified by consumers were taste (flavour) and smell of the milk; foreign matter; adulteration with water; and level of hygiene of personnel and milk handling equipment. Some respondents said that price was an important factor of quality and safety but most considered it a minor criterion. Adulteration of milk with water was a major problem identified by consumers and this was mostly detected after using the milk to make yogurt. However, the quality criteria and indicators for processed milk and imported powdered milk were more related to packing quality and taste (Ousman 2007).

For local butter, the major quality and safety criteria mentioned were freshness (identified by milky taste), smell, taste, foreign matter, origin and, to some extent, price. Sheno, situated 80 km north of Addis Ababa, is considered to be the source of the best quality local butter and is used as a reference to differentiate quality. However, some consumers disagreed with this perception. The major problem with local butter quality was adulteration with foreign matter such as banana, a common practice among some unscrupulous merchants. As a result, consumers used various means such as smelling, tasting or melting to check for adulteration. The quality of local butter was also gauged differently depending on its intended use; fresh local butter was preferred for making *kitfo* while old/mature local butter was preferred for making *wot* (Ousman 2007). With regards to raw milk and local butter, the major indicators of safety were method of storage (e.g. storage in a refrigerator or cold pot was considered safer than storage in open containers), cleanliness of storage container, hygiene of the product handlers and, in the case of local butter, the extent of exposure to high temperature (Ousman 2007).

Consumers were also asked about their willingness to pay for desired quality and safety attributes. Around 60% of respondents were willing to pay 5–10% more than the current price if they got what they needed (Ousman 2007). This indicates that the consumers perceived that the raw milk or local butter they purchased was of low or inadequate quality and safety so they were willing to pay more if they were able to access safer products of better quality.

Thus, perceptions of Addis Ababa consumers of quality represented both objective and subjective dimensions. Most of the consumers consulted during the PRA mentioned quality and safety criteria separately but in some cases there was some overlap between the two so that an attribute primarily representing quality also had certain safety dimensions, and vice versa. For example, low fat beef may be considered better quality because it is safer for health, or a clean butchery or milk shop may be considered as selling safer beef or milk which is also inherently of better quality. The PRA revealed that even in the absence of scientifically based official standards, consumers have ways of identifying quality and safety

attributes of a product. During the PRA, the relative importance of the different attributes could not be established; this was followed up during the detailed survey.

Questionnaire for detailed survey

A questionnaire survey was conducted among 300 representative consumer households. The key element in the questionnaire was a set of tables of profiles for beef, raw milk and local butter for rating. Product profiles were developed on the basis of the attributes identified as most significant during the PRA. Rating of preference for a profile was defined on a scale of 1 (least preferred) to 10 (most preferred).

For beef, the attributes and their respective levels were: fat content (high, low); freshness (fresh, not fresh); official stamp of the abattoir (present, absent); hygiene of meat handling staff and butchery (clean, unclean); and price per kg (low [ETB 28], medium [ETB 34], high [ETB 38]).

For raw milk, the attributes and their respective levels were: fat content (whole, skimmed); hygiene of premises and utensils (clean, unclean); smell (smelly, not smelly); purity (pure, adulterated); and price per litre (low [ETB 3], medium (ETB 4], high [ETB 5]).

For local butter, the attributes and their respective levels were: freshness (fresh, not fresh); hygiene of premises and utensils (clean, not clean); purity (pure, adulterated); origin (Sheno, non-Sheno) and price per kg (low [ETB 35], medium [ETB 45], high [ETB 60]).

A large number of profiles would emerge for each product if a full factorial design was prepared taking into account all possible combinations of the selected attributes and related levels. However, it would be difficult for respondents to rank or score such a large number of profiles in a meaningful way. For this reason, only a subset of all possible profiles was used. The subset, called an orthogonal array, is a type of design in which only the main effects are considered and interactions are assumed to be negligible (SPSS 2005). Following this principle, the orthogonal design of SPSS conjoint procedure was used to select 12 profiles out of all the possible combinations for each product: 8 profiles as part of the design and 4 as holdouts. A conjoint card was prepared for each product profile that depicted a pictorial representation with colour pictures of the various levels of the attributes. This procedure facilitated easy transfer of the ideas of each profile for explanation to the respondents which, in turn, improved the quality of the rating.

Sampling and data collection

Data were collected in June 2007. Sample households were selected by multistage stratified random sampling. Addis Ababa is divided into 183 *kebeles* (villages). The Central Statistics Authority classified 82 *kebeles* as dominated by low income households, 57 by middle income households, 6 by high income households, and the rest as having an even mixture of income groups. Out of these, six low income, four middle income and two high income *kebeles* were randomly selected. *Kebeles* with mixed income levels were left out. Next, 25 households were selected from each of the *kebeles* by systematic sampling, giving a total of 300 households. A reference household was identified randomly at a specific point within the selected *kebele* as the starting point and then the next household was selected at a certain interval in a desired direction along the road, the interval being dependent on the total number of households in the selected *kebele*. A full probability sampling procedure was not followed due to time and resource constraints; instead, the sample size was intuitively fixed at 300, assuming that this was large enough to ensure a reliable estimate. Cattin and Wittink (1982) reported that the sample size in commercial conjoint studies usually ranges from 100 to 1000, with a range of 300–550 considered typical.

Response elicitation began with the enumerator explaining the meaning of the product profiles with attributes and levels of attributes of each product and the meaning of the corresponding ratings. The respondents were then asked to explain their understanding of the levels of attributes and the ratings. This procedure took 15–30 minutes. These preliminary explanations were necessary to ensure that the attribute names provided the information that was intended in the survey. The respondents were then presented with 12 product profile cards for each product without any order and asked to rate the profiles on a scale of 1 to 10 as explained earlier.

Results and discussion
Relative importance of attributes or part worth of beef

Estimated part worth of selected quality and safety attributes of beef and related statistics are presented in Table 4.1. The results are statistically reliable as both Pearson's R and Kendall's tau statistics are highly significant at a probability of less than 1%.

Table 4.1. *Utility estimates of part worth of quality and safety attributes of beef, by income group*

Attributes and levels	Total sample	Low income	Middle income	High income
Fat content				
Low	0.60 (0.27)	0.35 (0.14)	0.62 (0.30)	0.83 (0.40)
High	−0.60 (0.27)	−0.35 (0.14)	−0.62 (0.30)	−0.83 (0.40)
Freshness				
Non-fresh	−1.02 (0.33)	−1.20 (0.17)	−0.97 (0.36)	−0.90 (0.49)
Fresh	1.02 (0.33)	1.20 (0.17)	0.97 (0.36)	0.90 (0.49)
Abattoir stamp				
Absent	−1.04 (0.22)	−0.89 (0.11)	−1.07 (0.24)	−1.17 (0.33)
Present	1.04 (0.22)	0.89 (0.11)	1.07 (0.24)	1.17 (0.33)
Hygiene of premise and staff				
Unclean	−1.12 (0.32)	−0.86 (0.16)	−1.14 (0.35)	−1.49 (0.47)
Clean	1.12 (0.32)	0.86 (0.16)	1.14 (0.35)	1.49 (0.47)
Price (ETB/kg)				
28	−0.10 (0.37)	0.12 (0.19)	−0.12 (0.41)	−0.34 (0.55)
34	0.00 (0.00)	.000 (0.00)	0.00 (0.00)	0.00 (0.00)
38	0.10 (0.37)	−0.12 (0.19)	0.12 (0.41)	0.34 (0.55)
Constant	4.48 (0.32)	4.627 (0.16)	4.49 (0.35)	4.20 (0.47)
Pearson's R	0.99***	0.99***	0.99***	0.99***
Kendall's tau	0.93***	0.93***	0.93***	0.93***
Kendall's tau for holdouts	0.33	0.33	0.33	0.33

Standard error in parentheses.
*** Significant at 1%.
Source: Field survey (2007).

The part worth of fat content indicates that high fat content in beef gave lower utility to consumers than low fat content and the relative dislike for high-fat beef was higher among higher income households. One possible reason is that while beef was among the few dietary sources of fat for low income households, high income households could obtain fat from a variety of sources and thus were much more sensitive to high fat content in the beef they bought due to health reasons.

The part worth of freshness shows that the utility derived from purchase of fresh beef declined as income level increased. Over half of the high income households bought beef once or twice a week while only a quarter of the low income households did so (Table 4.2). Some consumers bought beef from more than one outlet (Table 4.3). For the total sample, the market outlets widely visited to purchase beef were butcheries in local wet markets followed by special butcher shops located in different parts of the city along main roads or near residential areas. Supermarkets were frequently visited by over half of high income households and a few low income households. Those who bought from butcher shops usually bought fresh beef while those who bought from supermarkets usually bought frozen/refrigerated beef. Hence low income buyers who purchased mostly from butcher shops for

immediate consumption were more sensitive to price. As many butcher shops did not have the means to preserve beef for long periods, their customers, who were mostly low income, demanded that the product be fresh.

Table 4.2. *Frequency of purchasing food items for consumption, by consumer income group*

Frequency	Total sample (%)	Low income (%)	Middle income (%)	High income (%)
As necessary	55.0	68.9	52.6	41.6
Daily	1.7	2.6	1.1	2.1
3–4 times a week	4.3	3.8	4.0	6.3
Twice a week	13.0	10.4	14.3	12.5
Once a week	26.0	14.3	28.0	37.5
Total	100	100	100	100

Source: Field survey (2007).

Table 4.3. *Market outlet where beef was bought by sampled households*

Outlet	Percent of households within the income group			
	Total sample	Low income	Medium income	High income
Producer's residence or local market	1	0	1	1
Butcher in local wet market	90	60	94	74
Supermarket	14	0	11	54
Special butcher shop	60	73	57	18

Source: Field survey (2007).

The part worth of abattoir stamp indicates that consumers derived higher utility from buying beef from an officially stamped carcass; high income households were relatively more sensitive to this attribute. In general, the abattoir stamp was regarded as a form of quality assurance to consumers that the meat was inspected and found to be disease-free and thus safe for consumption. The relatively low value of the official abattoir stamp among low income consumers may be partly due to the fact that these households consumed small quantities of meat mostly in cooked form so might not worry too much about the presence of tapeworms which are destroyed upon cooking, while the higher income households consumed larger quantities of meat in a variety of forms, including eating it raw.

The part worth of level of hygiene of the premises and meat handling staff indicates that consumers derived higher utility from buying beef from hygienic butcheries and meat handlers. The high income households were highly sensitive to hygiene while the low income households were relatively less sensitive. This sensitivity might be the reason why more high income households bought beef from supermarkets as opposed to butcheries. Overall, 14% of households bought beef from supermarkets. However, during the month prior to the survey, none of the low income households reported buying beef from supermarkets while 11% of middle income households and 54% of high income households reportedly did so.

During the PRA some consumers reported that high price of beef could indicate better quality while others thought price was not an indicator of quality. Thus, in the empirical model, the price attribute was modelled as 'discrete' i.e. no direction of influence of price on utility was assumed. Rather, it was left to the model to reveal. The result shows that the part worth of price was low with a high standard error, indicating that price was not an important determinant of quality and safety; this result is consistent with the findings of the PRA. However, the positive coefficient indicates that for some consumers, high price might be an indicator of quality. This is probably because these consumers did not have adequate information beforehand about the quality of beef they were buying, though they observed the beef physically and might have had some perception or expectation about quality but were not able to verify or validate that at the time of purchase. As a result, they tended to believe that price differential was merely due to quality differential. Hence, some consumers probably tended to believe that given two products of similar attributes but different prices, the higher-priced one was of better quality. This weak inference about quality based on price could have been solved if there were official standards defining quality which could be verified or observed from labelling, rather than the local conventional way of judging quality and safety.

Among the sample households, 48% believed that the beef they purchased during the month prior to the survey was safe and 45% believed it was of good quality. Like the PRA, although quality and safety criteria were mentioned separately by most households, in some cases there was some overlap between the two so that an attribute primarily representing quality also had a safety dimension and vice versa. About 64% of the sample households expressed willingness to pay for quality and safety enhancements, indicating that there was a gap between what they expected and what was available in the market (Table 4.4).

Table 4.4. *Perception of purchased beef and willingness to pay for improved quality and safety*

	Percentage of households			
	Total sample	Low-income	Middle-income	High-income
Perception of purchased beef				
Safe	48.3	41.6	48.6	58.3
Good quality	44.7	39.0	44.0	54.2
Willingness to pay for improved attributes of beef				
Safety	63.7	53.2	63.4	81.3
Good quality	63.7	50.6	64.0	83.3

Source: Field survey (2007).

The proportion of households that were satisfied with the quality and safety of current purchases of beef and that were willing to pay for better quality and safety enhancements

increased as income level increased. This again indicates the existence of a demand gap for quality and safety between consumers, with high income groups being a niche market.

Total utility of beef profiles

Assuming that utility from different attributes is additive, the results in Table 4.1 were used to estimate the total utility one would get from beef of a certain profile (Table 4.5). Profile 1, for example, gave a total utility of 3.9 units, which was the most preferred while profile 4 was the least preferred. Thus, the most preferred profile of beef was fresh, high-priced, low-fat beef with an official abattoir stamp, sold at a clean outlet by hygienic staff. The least preferred profile of beef was non-fresh, high-priced, low-fat beef without an official abattoir stamp, sold at an unclean outlet by unhygienic staff.

Table 4.5. *Calculated total utility of the 12 profiles of beef ranked by consumers*

Profile	Official stamp	Hygiene	Fat content	Freshness	Price (ETB/kg)	Total utility
1	Present	Clean	Low	Fresh	38	3.9
2	Present	Unclean	High	Not fresh	34	−1.7
3	Absent	Clean	Low	Fresh	38	1.8
4	Absent	Unclean	Low	Not fresh	38	−2.5
5	Present	Clean	High	Fresh	38	2.7
6	Absent	Clean	Low	Fresh	34	1.7
7	Absent	Unclean	Low	Fresh	34	−0.5
8	Present	Unclean	Low	Fresh	28	1.4
9	Absent	Clean	High	Fresh	38	0.6
10	Absent	Unclean	High	Fresh	38	−1.6
11	Present	Clean	Low	Not fresh	38	1.8
12	Absent	Clean	High	Not fresh	28	−1.6

Source: Field survey (2007).

Relative importance of individual attributes of beef

For the total sample, freshness was the most important attribute in consumers' beef purchase decisions, followed in descending order by hygiene of shop and staff, abattoir stamp, price and fat content (Table 4.6). When deciding to buy beef, the average household gave 23.5% of the weight of the purchase decision to freshness, 23.4% to hygiene of the premises and meat handling staff, 18.9% to the presence or absence of official abattoir stamp, 17.6% to price and the remaining 16.6% to fat content of the beef. However, high income households gave hygiene the highest weight of the purchase decision while low income households gave the highest weight to freshness. For middle income households, freshness and hygiene were equally important.

Table 4.6. *Relative importance values of quality and safety attributes of beef, by income group*

Attribute	Percentage of households			
	Total sample	Low income	Middle income	High income
Freshness	23.5	26.0	23.1	21.1
Hygiene	23.4	20.1	23.8	27.5
Stamp	18.9	18.4	18.8	20.2
Price	17.6	18.9	17.5	16.0
Fat content	16.6	16.7	16.9	15.2
Total	100.0	100.0	100.0	100.0

Source: Field survey (2007).

Overall, freshness (primarily a quality attribute) and hygiene (primarily a safety attribute) were given higher and almost equal weight. Other quality and safety attributes (abattoir stamp, price and fat content) were given somewhat lower but almost equal weight. This ordering, especially the least weight given to fat content (in the entire sample as well as in all income groups), is contrary to the common belief that Ethiopian consumers have strong preference for high-fat beef. However, the profiles for beef were prepared for the product as a whole without regard to specific cuts or forms of consumption. During the month prior to the survey, 80% of the sample households bought beef for making *wot*, 40% for making *tibbs* and 13% for making *kitfo*. So in reality, when overall beef consumption is considered, preference for high-fat content might not be high but for a specific cut or form of consumption (e.g. raw beef consumption), high-fat beef might still be preferred; this was not separately captured in the beef profiles.

Relative importance of individual attributes of raw milk

The relative importance of the individual attributes of raw milk is summarized in Table 4.7. For the entire sample, whole milk was more preferred than skimmed milk. Comparison across income groups showed that middle income consumers had a slightly higher preference for whole milk compared to their low- and high income counterparts. For the entire sample, the part worth of hygiene, smell and adulteration indicated that consumers derived a higher utility from buying clean, non-smelly, unadulterated milk. Comparison across income groups indicated that sensitivity for milk hygiene increased with income level. Low income households were more sensitive to milk adulteration than their high income counterparts, perhaps because most poor consumers bought their milk raw while most high income consumers bought pasteurized milk. Price was a relatively less important factor in defining the safety and quality of raw milk given its low utility value.

The most important quality and safety criteria were hygiene and smell followed by fat content, adulteration and price. Specifically, hygiene was given 27% of the weight of the

purchase decision, smell 22%, adulteration 20%, price 17% and fat content 14% (Table 4.8). The order of importance remained the same across income groups though the relative strength of an attribute varied, e.g. high income households gave much more importance to hygiene compared to middle- and low income households.

Table 4.7. *Utility estimates of part worth of quality and safety attributes of raw milk, by income group*

Attributes and levels	Total sample	Low income	Middle income	High income
Fat content				
Skimmed	–0.69 (0.27)	–0.68 (0.24)	–0.76 (0.29)	–0.61 (0.34)
Whole	0.69 (0.27)	0.68 (0.24)	0.76 (0.29)	0.61(0.34)
Hygiene				
Unclean	–1.47 (0.39)	–1.20 (0.35)	–1.57 (0.42)	–2.10 (0.49)
Clean	1.47 (0.39)	1.20 (0.35)	1.57 (0.420	2.10 (0.49)
Smell				
Smelly	–1.24 (0.34)	–1.11 (0.30)	–1.31 (0.36)	–1.52 (0.42)
Not smelly	1.24 (0.34)	1.11 (0.30)	1.31 (0.36)	1.52 (0.42)
Adulteration				
Adulterated	–0.59 (0.41)	–0.82 (0.36)	–0.45 (0.44)	–0.19 (0.51)
Pure	0.59 (0.41)	0.82 (0.36)	0.45 (0.49)	0.19 (0.51)
Price (ETB/litre)				
3	0.31 (0.46)	0.31 (0.40)	0.28 (0.49)	0.36 (0.57)
4	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
5	–0.31 (0.46)	–0.31 (0.40)	–0.28 (0.49)	–0.36 (0.57)
Constant	4.84 (0.39)	4.86 (0.34)	4.82 (0.42)	4.83 (0.49)
Pearson's R	0.99***	0.99***	0.99***	0.99***
Kendall's tau	1.00***	0.93***	1.00***	1.00***

Standard error in parentheses.
*** Significant at 1%.
Source: Field survey (2007).

Table 4.8. *Relative importance values of quality and safety attributes of raw milk, by income group*

Attribute	Total sample	Low income	Middle income	High income
Fat content	14.11	14.60	14.61	11.49
Hygiene	26.42	23.81	27.99	31.33
Smell	21.77	20.94	22.50	22.86
Adulteration	20.98	22.92	19.21	18.64
Price	16.72	17.74	15.69	15.69
Total	100.00	100.00	100.00	100.00

Source: Field survey (2007).

Based on the total utility of each profile of milk, the most preferred milk profile was high-priced, pure, non-smelly whole milk sold in hygienic premises (Profile 1) and the least

preferred was low-priced, pure, smelly skimmed milk sold in unhygienic premises (profile 10) (Table 4.9).

Table 4.9. *Calculated total utility of the 12 profiles of raw milk ranked by consumers*

Profile	Fat content	Hygiene of premises and utensils	Smell	Adulteration	Price (ETB/litre)	Total utility
1	Whole	Clean	Not smelly	Pure	5	3.67
2	Whole	Unclean	Smelly	Adulterated	4	−2.60
3	Skimmed	Clean	Not smelly	Pure	5	2.29
4	Skimmed	Unclean	Not smelly	Adulterated	5	1.89
5	Whole	Clean	Smelly	Pure	5	1.27
6	Skimmed	Clean	Not smelly	Pure	4	2.60
7	Skimmed	Unclean	Not smelly	Pure	4	0.98
8	Whole	Unclean	Not smelly	Pure	3	1.29
9	Skimmed	Clean	Smelly	Pure	5	−0.11
10	Skimmed	Unclean	Smelly	Pure	5	−3.11
11	Whole	Clean	Not smelly	Adulterated	5	2.49
12	Skimmed	Clean	Smelly	Adulterated	3	−0.67

Source: Field survey (2007).

Relative importance of individual attributes of local butter

Table 4.10 summarizes results of the relative importance of attributes of local butter. Results of the part worth of freshness showed that higher utility was derived from purchase of fresh than non-fresh butter. Across income groups, however, middle income consumers were more sensitive to the freshness of local butter than were high- and low income consumers. The part worth of the origin of the local butter revealed that households derived higher utility from butter sourced from Sheno compared to non-Sheno butter. Comparison across income levels showed that the importance of origin as a quality criterion for local butter declined with rise in income levels. Hygiene of the premises and staff selling local butter was valued most by high income consumers and least by middle income ones while purity of local butter was valued almost equally across all income levels.

During purchase of local butter, consumers gave 31% of the weight of the purchase decision to purity, 22% to hygiene, 19% to freshness, 15% to price and 14% to origin (Table 4.11). The order of importance of the criteria was the same across income groups.

Based on the total utility of each profile, the most preferred profile of local butter was low-priced, fresh, pure Sheno butter sold in hygienic premises (Profile 5) and the least preferred was low-priced, non-fresh, adulterated, non-Sheno butter sold in unhygienic premises (Profile 8) (Table 4.12).

Table 4.10. *Utility estimates of part worth of quality and safety attributes of local butter, by income group*

Attributes and levels	Total sample	Low income	Middle income	High income
Freshness				
Non-fresh	–0.81(0.28)	–0.76 (0.20)	–0.89 (0.27)	–0.78 (0.53)
Fresh	0.81(0.28)	0.76 (0.20)	0.89 (0.27)	0.78 (0.53)
Origin				
Non-Sheno	–0.59 (0.28)	–0.61 (0.20)	–0.57 (0.27)	–0.54 (0.53)
Sheno	0.59 (0.28)	0.61 (0.20)	0.57 (0.27)	0.54 (0.53)
Hygiene				
Unclean	–0.99 (0.28)	–0.98 (0.20)	–0.90 (0.27)	–1.20 (0.53)
Clean	0.99 (0.28)	0.98 (0.20)	0.90 (0.27)	1.20 (0.53)
Purity				
Not pure	–1.46 (0.28)	–1.43 (0.20)	–1.49 (0.27)	–1.48 (0.53)
Pure	1.46 (0.28)	1.43 (0.20)	1.49 (0.27)	1.48 (0.53)
Price (ETB/kg)				
35	0.60 (0.33)	0.65 (0.24)	0.53 (0.33)	0.56 (0.63)
45	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
60	–0.60 (0.33)	–0.65 (0.24)	–0.53 (0.33)	–0.56 (0.63)
Constant	4.59 (0.29)	4.74 (0.21)	4.59 (0.28)	4.10 (0.55)
Pearson's R	0.98***	0.99***	0.98***	0.95***
Kendall's tau	0.79***	0.93***	0.93***	0.86***

Standard error in parentheses.
*** Significant at 1%.
Source: Field survey (2007).

Table 4.11. *Relative importance values of quality and safety attributes of local butter, by income group*

Attribute	Total sample	Low income	Middle income	High income
Freshness	19.27	18.57	21.44	16.94
Origin	13.74	14.37	13.36	12.59
Hygiene	21.59	21.37	20.13	25.40
Purity	30.78	29.92	31.45	32.05
Price	14.61	15.78	13.62	13.03
Total	100.00	100.00	100.00	100.00

Source: Field survey (2007).

Table 4.12. *Calculated total utility of the 12 profiles of local butter ranked by consumers*

Profile	Freshness	Hygiene of premises and utensils	Purity (absence of foreign matter)	Origin	Price (ETB/kg)	Total utility
1	Fresh	Unclean	Not pure	Sheno	60	−1.65
2	Fresh	Unclean	Pure	Non-Sheno	45	0.69
3	Fresh	Clean	Not pure	Non-Sheno	35	0.35
4	Non-fresh	Clean	Not pure	Sheno	45	−0.69
5	Fresh	Clean	Pure	Sheno	35	4.45
6	Non-fresh	Clean	Pure	Non-Sheno	60	0.45
7	Non-fresh	Unclean	Pure	Sheno	35	0.85
8	Non-fresh	Unclean	Not pure	Non-Sheno	35	−3.25
9	Non-fresh	Unclean	Pure	Non-Sheno	35	−0.93
10	Fresh	Unclean	Pure	Non-Sheno	35	0.69
11	Fresh	Unclean	Not pure	Non-Sheno	35	−1.63
12	Fresh	Clean	Pure	Non-Sheno	45	2.67

Source: Field survey (2007).

Summary and conclusions

This study has shown that in the absence of official standards for beef, raw milk and local butter, consumers in Addis Ababa, Ethiopia differentiate the quality and safety of these products on the basis of various attributes. The quality and safety of beef was assessed on the basis of freshness, hygiene of sales outlet and personnel, abattoir stamp, fat content and price. For raw milk, the most important quality and safety attributes were fat content, hygiene and adulteration while for local butter, freshness, hygiene, purity and origin were most important. These attributes represent both objective and subjective dimensions of quality, and the nature of responses also indicated that consumers considered safety as part of quality as is assumed under the holistic approach to quality assessment.

Among the quality and safety attributes of beef, consumers gave weight to freshness, hygiene of sales outlet and personnel, abattoir stamp, fat content, and price, in that order. For raw milk, the order of importance of quality and safety attributes was hygiene, smell, adulteration, price and fat content. For local butter, the order of importance of quality and safety attributes was purity, hygiene, freshness, price and origin. Rating of attributes varied across income groups and among attributes. In the case of beef, freshness was most important for low income households while fat content was most important for high income households. Abattoir stamp was less important for low income households but very important for high income households. Hygiene was rated high by high income households and low by low income households. In the case of local butter and raw milk, the order of importance of the various attributes was similar. However, only in the case of raw milk was the weight given to hygiene by high income households much higher than other groups. Otherwise, differences

among income groups were less pronounced compared to beef. Price was not an important attribute for quality and safety for the entire sample as well as for different income groups.

Thus, the following recommendations can be made on the basis of the study results:

- Hygiene of beef, milk and local butter shops and sellers is a major concern of consumers in Addis Ababa. Freshness of beef, raw milk and local butter is another important quality attribute demanded by consumers. As both these attributes have public health implications, steps should be taken to ensure that all market actors maintain high standards of hygiene.
- Red beef with low levels of fat is more preferred by consumers though there may be specific demand for fatty beef for specific uses. This information needs to be transmitted to producers so that they plan their husbandry practices to respond adequately to consumer demand rather than try to sell what they produce without adequate knowledge about the market.
- It is advisable to formulate quality and safety standards for beef, raw milk and local butter that are suitable for the domestic market. The criteria and indicators currently used by consumers and market actors on an informal and private basis can be used to define official grades and standards for these products. These official standards could also form a legal basis for sellers to substantiate their price differences. Further, they will encourage market-driven approaches to production.
- More systematic studies should be conducted on demand for quality and safety in food commodities—particularly livestock products—in order to develop consistent locally suitable grades and standards and update them continuously to suit changing consumer perceptions on quality and safety and related demand.
- There are methodological challenges to assess demand for food quality and safety in a situation where there are no official grades and standards for defining quality and safety. The process of capturing consumer perceptions and interpreting them requires careful consideration and use of appropriate techniques. In this study, a PRA was conducted first to identify criteria and indicators that consumers use to differentiate quality and safety in beef, raw milk and local butter. The results of the PRA were used in a formal survey to collect quantitative data for statistical analysis. The results of the PRA and the formal survey showed that these were complementary methods for collecting and interpreting data for the situation existing in Ethiopia. Further, results of the PRA were confirmed by more formal statistical analysis, indicating that a carefully conducted PRA is a robust technique to assess criteria and indicators for food quality and safety, particularly where time and resources are limited.
- Food quality and safety should be considered as major topics for public policy. Experiences elsewhere suggest that regulatory responses have tended to fall in two categories: (1) enforcement of common standards for food safety, which has no immediate impact on consumer food choice but is debatable in terms of economic efficiency when consumer preferences for safety are assumed to be heterogeneous and conditioned by local circumstances which are different from developed countries,

and (2) attempts to provide transparency and encourage consumers to form their own judgements on food safety, supported by mechanisms of public participation, consumer education and consumer information instruments such as labelling (Caswell and Mojduszka 1996; Ritson and Mai 1998). The second approach appears to be more relevant under current conditions and as a starting point to gradually move to the first.

References

Bredahl L. 2001. Determinants of consumer attitudes and purchase intentions with regard to genetically modified foods: Results of a cross-national survey. *Journal of Consumer Policy* 24:23–61.

Brunso K, Fjord TA and Grunert KG. 2002. *Consumers' food choice and quality perception.* MAPP Working Paper 77. Aarhus School of Business, Aarhus, Denmark.

Burton M and Young T. 1996. The impact of BSE on the demand for beef and other meats in Great Britain. *Applied Economics* 28:687–693.

Burton M, Rigby D, Young T and James S. 2001. Consumer attitudes to genetically modified organisms in food in the UK. *European Review of Agricultural Economics* 28(4):479–498.

Caswell JA and Mojduszka EM. 1996. Using informational labeling to influence the market for quality in food products. *American Journal of Agricultural Economics* 78:1248–1253.

Cattin P and Wittink DR. 1982. Commercial use of conjoint analysis: A survey. *Journal of Marketing* 46:44–53.

Grunert KG. 2005. Food quality and safety: Consumer perception and demand. *European Review of Agricultural Economics* 32(3):369–391.

Grunert KG, Bredahl L and Scholderer J. 2003. Four questions on European consumers' attitudes to the use of genetic modification in food production. *Innovative Food Science & Emerging Technologies* 4:435–445.

Lancaster K. 1971. *Consumer demand: A new approach.* Columbia University Press, New York, USA.

Louviere JJ, Eagle TC and Cohen SH. 2005. *Conjoint analysis: Methods, myths and much more.* Working Paper No. 05–001.

Olsen SO. 2002. Comparative evaluation of the relationship between quality, satisfaction and repurchase loyalty. *Journal of the Academy of Marketing Science* 30:240–249.

Ousman N. 2007. *Participatory rapid appraisal on consumer preferences for quality and safety of milk and local butter in Addis Ababa, Ethiopia.* Unpublished report submitted to the International Livestock Research Institute, Addis Ababa, Ethiopia.

Reardon T, Timmer CP, Barret CB and Berdegue J. 2003. The rise of supermarkets in Africa, Asia and Latin America. *American Journal of Agricultural Economics* 85:1140–1146.

Ritson C and Mai LW. 1998. The economics of food safety. *Nutrition and Food Science* 98:253–259.

SPSS. 2005. *Conjoint analysis: Syntax reference guide.* SPSS Inc., USA.

Zeithaml VA. 1998. Consumer perceptions of price, quality, and value: A means-end model and synthesis of evidence. *Journal of Marketing* 52(3):2–22.

Chapter 5   Consumer perceptions of the quality and safety of meat from small ruminants: Implications for livestock keepers in Tunisia

Lokman Zaibet[1] and Nadhem Mtimet[2]

1. l.zaibet@cgiar.org; research scientist at the International Livestock Research Institute, Nairobi, Kenya

2. mnadhem@hotmail.com; assistant professor at Ecole Supérieure d'Agriculture de Mograne, Zaghouan, Tunisia

Abstract

This paper investigates the behaviour of Tunisian consumers with regard to their perceptions of selected quality and safety attributes of meat products from small ruminants. Conjoint analysis assessed consumer preference and perception of meat quality and safety which were then used to assess consumer willingness to pay for higher quality. Consumers preferred and were willing to pay more for packaged meat and meat from younger animals; this implies that keepers of small ruminants in Tunisia need to gear production towards these attributes. Public authorities should work towards providing assurance of the safety attributes that consumers prefer and developing relevant animal breeding, feeding and health programs for smallholder livestock keepers.

Key words: small ruminants, meat, consumer perceptions, Tunisia

Introduction

The quality of meat products may be assessed on the basis of a number of externally detectable attributes. Large food retailers such as Sainsbury in the UK rely on private standards based on International Organization for Standardization (ISO) principles (Zaibet and Bredahl 1998; Holleran et al. 1999). On the other hand, there are quality attributes such as taste, wholesomeness or healthiness which consumers have traditionally valued subjectively (Gilg and Battershill 1998). But with the spread of food-borne illnesses, assurance of food safety and quality is becoming significant in influencing consumers' purchase decisions. For meat products, such quality and safety indicators include health certificates displayed at the market place or veterinary stamps on carcasses at butcher shops.

The current trends in demand for quality and safety are also increasing in developing countries. In Tunisia, the demand for quality and safety of food products has emerged in response to trade requirements and consumers' demands. While the first quality programs were initiated to meet European Union regulations regarding quality and safety of exported foodstuffs, subsequent programs addressed the growing demand of local consumers for quality products as a result of improved purchasing power during the last two decades (Zaibet 2007). Trends in red meat consumption in Tunisia show a steady increase of 12% per year between 1997 and 2006. The same trends show a preference for meat products from small ruminants which amounts to 48% of total red meat consumption against 41% for beef products. Although these figures do not explicitly show the demand for quality, other trends such as the development of supermarkets and hypermarkets (currently more than 168 around the capital city Tunis) with more stringent quality requirements will act as a major driver to increase such demand.

As an output of part of a larger project aimed at improving livelihoods of poor livestock keepers, this paper provides useful insights on how new developments in market requirements and changing consumer habits may influence the responsiveness of producers in order to maintain market share. Most livestock keepers in Tunisia are smallholders whose farms are less than 20 hectares in size and who keep less than 50 animals. The market chains used by smallholders vary in length. Short market chains exist mainly in production areas where farmers are directly linked to consumers or indirectly via an intermediary (e.g. farmer–butcher–consumer). In the longer market chains, farmers are linked to consumers through intermediaries at the regional or national levels and access to information is important in negotiating prices and other product attributes.

The aim of this paper is to investigate the behaviour of Tunisian consumers with regard to their perceptions of quality and safety of meat products from small ruminants. The results will be useful in guiding the decisions of livestock producers and policymakers during selection

of animal breeds or designing of strategies to support animal feeding, health and marketing. This paper is the first attempt to assess the behaviour of Tunisian consumers with regard to their perceptions of the quality and safety of meat and meat products from small ruminants. The study was based on a conjoint analysis to assess consumer preference, which was then used to derive consumer willingness to pay for higher levels of various product attributes.

The remainder of the paper is organized as follows: The following section presents the conjoint analysis method and its application in analysis of consumer perceptions of quality. Next, the theoretical framework and empirical model are addressed. The subsequent section explains the questionnaire design and study methodology. Finally, the empirical results and discussion are presented, before concluding the paper with implications for smallholders and policymakers.

Conjoint analysis and consumer perception

Quality perception and consumer behaviour studies have gained increasing importance in the last two decades. Literature on food analysis indicates that demand for product safety and quality is viewed as part of the growing trend towards consumption of natural healthy food, which is linked to greater awareness of health issues and increasing economic wellbeing in general (Albisu 2007a). Product quality has become a market requirement (Albisu 2007b). Factors influencing demand for product quality have been found to be linked to social, economic and cultural contexts and other factors that affect dietary habits.

Conjoint analysis is a market research tool used to study consumer preference and behaviour (Cattin and Wittink 1982). The technique has its theoretical foundations in the model of Lancaster (1971) which states that goods are valued for the attributes they possess. In conjoint analysis, the researcher chooses a set of attributes for each product and consumers are asked to express their preferences for the pre-selected attributes. There are two techniques frequently used in conjoint experiments: rating and ranking of the selected attributes. According to Wittink and Cattin (1989), in the United States the use of rating accounts for 46% of conjoint analysis research while the use of ranking represents only 34%. In Europe, however, 70% of conjoint analysis research uses ranking against 22% that uses rating (Wittink et al. 1994; Darmon and Rouziès 1999). Compared to rating, the ranking procedure is easier for respondents to use. Also, rating of differences in scores between any two products could be meaningless and the use of linear regression with the rating method is misleading.

Developed first in the 1970s (Green and Rao 1971; Green and Srinivasan 1978), conjoint analysis methodology has gained a lot of interest as a scientific tool in consumer behaviour studies (Cattin and Wittink 1982; Wittink and Cattin 1989). Conjoint analysis has gained

great popularity in marketing research and has been applied in many areas such as transportation, telecommunication, environment, marketing and human health. In agro-food products, various studies have used conjoint analysis to explore consumer behaviour: for fruit and vegetable demand in the UK (Loader 1990); for the UK market for eggs (Ness and Gerhardy 1994); for extra virgin olive oil demand in Italy (van der Lans et al. 2001); for olive oil consumption in the UK (García et al. 2002); for fish products in Oman (Boughanmi et al. 2007); and for concentrated yoghurt consumption in Lebanon (Haddad et al. 2007).

Theoretical framework and empirical model

In consumer behaviour research, many variables of interest cannot be observed directly. Preferences, attitudes and perceptions are such constructs that can only be measured indirectly by use of observable indicators. The response variables related to consumer attitude or preference, which are unobserved, are captured by designing appropriate questionnaires administered directly to the population of interest and using ranking or rating techniques such as the Likert scale. The latent variable models are scaling techniques that were developed for deriving information on unobservable constructs of interest from the indicators. In latent variable models there is no direct relationship between the predictor and response variables. Rather, they are both related to an underlying reduced-rank set of latent variables. The underlying latent variables could be treated as continuous or discrete variables, according to Bartholomew and Knott (1999). However, as shown by Heinen (1996), the distribution of a continuous latent variable model can be approximated by a discrete distribution.

In this paper, the theoretical model follows a latent variable regression as described by Greene (2003). Given the discrete nature of the dependent variable (which shows the preference of consumers by ranking of the products), the appropriate latent variable regression is represented by the ordinal probit model, which is as follows:

$$y_i^* = \beta' x_i + \varepsilon \qquad (5.1)$$

where

y^* is the latent dependent variable with values 0, 1, 2, ..., j;
β is the vector of coefficients to be estimated;
x_i is the vector of independent variables; and
ε is the error term which is normally distributed N[0, 1].

The dependent variable is assessed based on the conjoint experiment as follows:

$y = 0$ if $y^* \leq 0$, for first choice

$y = 1$ if $0 < y^* \leq \mu_1$, for second choice

$y = 2$ if $\mu_1 < y^* \leq \mu_2$, for third choice

.

.

.

$y = J$ if $\mu_{j-1} \leq y^*$, for the $J+1$ choice

The terms μ_j are unknown parameters (thresholds) to be estimated with β coefficients. Assuming ε follows a reduced centred normal distribution, one obtains the following probabilities (Greene 2003):

$$\Pr ob[y = 0] = \Phi(-\beta'x)$$
$$\Pr ob[y = 1] = \Phi(\mu_1 - \beta'x) - \Phi(-\beta'x)$$
$$\Pr ob[y = 2] = \Phi(\mu_2 - \beta'x) - \Phi(\mu_1 - \beta'x)$$

.   (5.2)

.

$$\Pr ob[y = J] = 1 - \Phi(\mu_{J-1} - \beta'x)$$

Where Φ is a cumulative distribution function. For all probabilities to be positive we also impose the condition:

$$0 < \mu_1 < \mu_2 < ... < \mu_{j-1}$$ (5.3)

The empirical model is then specified as an ordinal probit model in which the consumer ranking (preference) is the dependent variable and product attribute levels constitute the independent variables. The willingness to pay for higher levels of attributes is derived from the following equation (Haefele and Loomis 2001):

$$DP_a = -\frac{\beta_a}{\beta_p}$$

where

DP_a is the willingness to pay for attribute a;
β_a is the coefficient of attribute a in the probit model; and
β_p is the coefficient of price variable in the model.

Questionnaire design and methodology

A consumer survey was carried out in April and May 2006 in Tunis (the capital city), Sfax (the second-largest city) and El Fahs, a rural area located at 50 km from the capital and home to one of Tunisia's largest livestock markets. Sample consumers were selected by a non-probabilistic convenience sampling method, resulting in a sample size of 184 comprising 46, 50 and 48 consumers, respectively, from Tunis, Sfax and El Fahs. A questionnaire was used to collect information about the characteristics of the respondents and their perceptions of the quality, safety and hygiene of meat products from small ruminants. Conjoint analysis was then used to determine the relative importance of four quality attributes: type/species of animal, age of animal, packaging of meat product and price of meat product. Age of animal and packaging of meat product were used as proxies for fat content and product safety, respectively. Consumers rated their perceptions of the importance of specific quality and safety attributes, based on a 5-point Likert scale (1 = most important, 5 = least important).

Analysis of the socio-demographic characteristics of the selected consumers (Table 5.1) showed that 61% were aged between 30 and 49 years and 75% had at least secondary school education; this latter aspect is particularly important in conjoint analysis as it guarantees that the respondents understand the questions well and are willing to cooperate in the exercise. The sample, however, was not balanced with regard to gender as women comprised only a third of the sample. This may be explained by social factors; in most Tunisian cities men are in charge of food procurement although in areas where supermarkets and hypermarkets are emerging (mainly in the capital), women are increasingly becoming involved in this activity.

The quality attributes were selected according to the most recent literature available on meat consumption (Acebrón and Dopico 2000; Bernués et al. 2003; Bernabeu and Tendero 2005; Monson et al. 2005; Furnols et al. 2006). For each attribute, the corresponding levels were determined based on our knowledge of the market conditions. The levels used were as follows: goat and sheep (for type/species of animal); young and aged, as indicated by the butcher and acknowledged by the customer (age of animal); with and without packaging (packaging of meat product); and Tunisia dinar (TND)[1] 9, 11, 12 and 13 per kg (price of meat product).

On combining the four attributes and their respective levels, we obtained 32 hypothetical products. We used a fractional factorial and orthogonal design procedure of SPPS version 13.0 to reduce this number to a feasible subset of eight products. This design allows the

---

1. Tunisia dinar (TND). In 2009, USD 1 = TND 1.28.

number of combinations to be reduced while preserving the orthogonality of the attributes, leading to a matrix of uncorrelated variables (Montgomery 2001). Two combinations out of the eight selected by the design were judged to be unrealistic to the market conditions and were therefore removed from the final set of products. This further reduced to six the number of product cards presented and rated by the respondents.

Table 5.1. *Socio-demographic characteristics of the sampled consumers*

Characteristic	Class	Percentage of respondents
Age (years)	20 to 29	12.5
	30 to 39	28.8
	40 to 49	32.6
	50 to 59	18.5
	60 and over	7.6
Level of education	None	7.0
	Primary	17.3
	Secondary	42.2
	Tertiary	33.5
Gender	Male	64.1
	Female	35.9
Residence status	Non resident	21.7
	Resident at El Fahs	26.1
	Resident at Sfax	27.2
	Resident at Tunis	25.0
Income (TND*/month)	Less than 300	20.1
	300 to 499	27.7
	500 to 699	28.8
	700 to 999	15.8
	1000 and above	7.6

* Tunisia dinar (TND). In 2009, USD 1 = TND 1.28.
n = 184.
Source: Field survey.

Conjoint experiment and empirical results

Before presenting the conjoint experiment results, it is worth discussing the results from univariate analysis of the questionnaire with regard to consumer safety concerns. Safety traits were identified based on current regulations governing retail sale of meat; these traits included veterinary stamped meat, cleanliness of the butcher shop and refrigerated meat. Residues in meat were also considered as they are linked to the type of feedstuff used.

Consumers rated their perceptions of the relative importance of the meat safety traits. Over 70% of respondents were strongly concerned about veterinary stamped meat, cleanliness of butcher shop and refrigerated meat (Table 5.2). The veterinary stamp indicates that the animal was slaughtered in a legal and approved slaughterhouse and, to some extent, was sold through regular market chains. Almost 50% of respondents considered residues in meat products to be an important safety concern; these residues result mainly from the use of

non-conventional feedstuffs or drugs. The implications of these results for small farmers are discussed in the final section of this paper.

Table 5.2. *Consumer perceptions of meat and the importance of meat safety attributes*

Concerns	Strongly agree (%)	Agree (%)	Indifferent (%)	Disagree (%)	Strongly disagree (%)
Veterinary stamp	76.1	5.8	8.7	3.6	5.8
Cleanliness	79.0	13.0	10.9	0.7	14.5
Refrigerated meat	71.7	6.5	7.2	5.1	9.4
Residues	28.3	18.8	18.8	5.1	9.4

Source: Field survey.

Figure 5.1 summarizes the rating of consumer perceptions of specific quality attributes, namely, health (hygiene, packaging), age, type/species and sex of the animal and price. Age of the animal and hygiene were the quality attributes that consumers perceived to be most important.
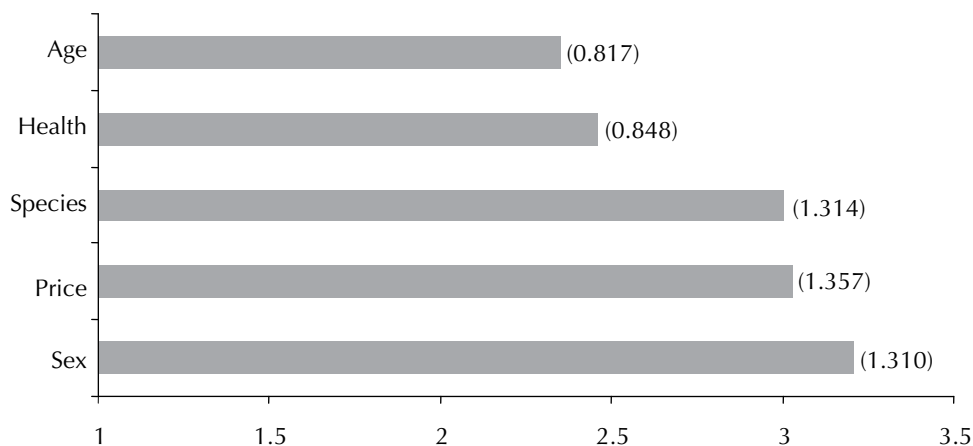
Quality and safety attributes rated on a scale of 1 (most important) to 5 (least important).
Standard error in parentheses.
Source: Field survey.
Figure 5.1. *Rating of consumer perceptions of quality attributes of small ruminants and meat products from small ruminants.*

Further insights about the relevance of these results were provided by analysing the ordered probit model of the conjoint experiment (Table 5.3). The model was estimated with the dependent variable being the rank given to the different product cards in the ranking experiment (a card is equivalent to a product characterized by a combination of attributes described earlier). The independent variables included interaction variables such as packaging × gender and type × gender. The rationale was that packaging was interpreted as a proxy for safety and hypothesized to be correlated to gender (women) based on the assumption that women were more concerned about food hygiene and would therefore

prefer to buy packaged meat. We tried to include other socio-economic variables in the model but they were not statistically significant so were dropped.

Table 5.3. *Ordered probit model estimates (from conjoint experiment)[a]*

Variable	Coefficient	Standard error
Type[b]	−1.5498	0.1006
Age[c]	−2.7785	0.1169
Packaging[d]	−0.4852	0.0781
Price[e]	0.3509	0.0134
Packaging × gender[f]	0.2181	0.0611
Type × gender[g]	−0.1411	0.0547
μ_1	0.7101	0.0380
μ_2	1.2969	0.0432
μ_3	1.9166	0.0524
μ_4	2.7874	0.0741
Number of observations	1104	
Log likelihood	−1740.778	
LR1 (5) χ^2	474.649	

a. The dependent variable takes the value of 0 if first choice, 1 if second choice etc.
b. Dummy variable that takes the value of 1 if meat is from sheep and 0 if from goat.
c. Dummy variable that takes the value of 1 if the animal is young and 0 if aged.
d. Dummy variable that takes the value of 1 if meat is packaged and 0 otherwise.
e. Continuous variable.
f. Gender takes the value of 1 for male and −1 for female.
g. The product of number of cards ranked × sample size.
All coefficients were significant at 1%.
Source: Field survey.

In Table 5.3, the goodness of fit of the model given by the log Likelihood Ratio (LR) and compared to a χ^2 test indicated that the model was statistically significant at 1% level. All coefficients in the model were also significantly different from zero at 1% level including the μ parameters. The effects of the variable attributes on sensory quality of meat and consumers' preferences were interpreted according to the magnitude and sign of the corresponding coefficient estimates.

Age of the animal had the highest coefficient in absolute value. Given that the variables were coded in descending order, the negative sign attributed to this variable indicates a stronger probability that consumers will choose meat from a young animal over meat from an aged animal. The younger the animal, the better the quality of its meat; in terms of consumer behaviour, this implies that consumers may use the age of the animal as a proxy for meat tenderness. The coefficient estimate of the type (species) of the animal was also negative indicating that sheep meat has a higher probability than goat meat of being chosen by consumers.

The estimate of the variable 'packaging of meat' was negative and significant, which means that consumers preferred packaged meat products sold in supermarkets and hypermarkets

as opposed to non-packaged meat sold by traditional butchers. The rise of supermarkets is likely to bring about changes in consumer behaviour whose impacts may be traced along the producer-to-consumer value chain.

The estimate of the price variable was positive, indicating that consumers are rational (according to consumer theory). In the conjoint experiment, higher price was assumed to indicate higher product quality. But even though a wide range of prices was used to define the product profile (TND 9–13), this variable was not found to be a good indication of quality. The literature also is ambiguous; Acebrón and Dopico (2000) found that consumers use price as reference to the quality of meat. Rao and Monroe (1988), on the other hand, found that for products with a relatively established quality, the use of price as an indicator of quality decreases as consumers get familiar with the products.

Finally, the socio-demographic characteristics were tested but did not improve the quality of the model. Thus, only variables in interaction with the previous attributes (packaging × gender and type × gender) were kept in the final model. The estimates of these variables were found to be significant and indicated that women preferred to buy more hygienic packaged meat products while men prefer to buy sheep meat (Table 5.3).

Based on the results of the model estimation, the willingness to pay a premium price for higher levels of quality attributes was evaluated. Consumers were willing to pay the highest premium for sheep meat rather than goat meat and for meat from a younger animal than from an older one (Table 5.4). Although packaged meat, a proxy for hygiene, was found to be significant, consumers were not willing to pay a high premium for this attribute. The results also suggest that men would be willing to pay more for sheep meat while women would be willing to pay more for packaged meat. However, these findings should be interpreted with caution, given the likely consumer biases at the time of valuing the price attribute in the conjoint experiment. Literature on consumer behaviour has found that hypothetical methods over-value price impacts and therefore the willingness to pay of consumers as compared to data gathered at the actual time of purchase (Shogren et al. 1999; Grunert 2005).

Table 5.4. *Willingness to pay for quality attributes of meat and meat products*

Variable	Willingness to pay (TND/kg)
Type (Sheep meat = 1)	4.417***
Age (Young = 1)	7.919***
Packaging (Yes = 1)	1.383***
Packaging × gender	– 0.622***
Type × gender	0.402*

*** Statistically significant at 1%.
* Statistically significant at 10%.
Source: Field survey.

Conclusions and implications

This paper is the first attempt to assess the behaviour of Tunisian consumers with regard to their perceptions of the quality and safety of meat and meat products from small ruminants. The implications of the results are useful for marketing institutions, policymakers and smallholder farmers to understand the changes in and implications of consumer habits and marketing requirements. National policies, such as those governing breeding and price support programs, have played a crucial role towards increasing the size of livestock herds in all regions and across all categories of farms. Current changes in the demand for meat are attributed to improved purchasing power of Tunisian consumers, urbanization and changes in lifestyle. Therefore, there has been debate over the consumers' choice of sheep vs. goat meat, the preferred age of the animal at slaughter and other attributes. These questions were driven by economic conditions (prices of meat and feed) but also by social and health concerns.

Results from this study support the general trend toward increased health concerns and preference for sheep meat. The main findings and their implications may be summarized as follows:

- Consumers are increasingly concerned about the hygiene and safety of meat sold at butcher shops. Thus, forms of quality assurance such as veterinary stamped meat are important. This has implications on the slaughter of animal in legal and approved slaughterhouses and, to some extent, the sale of meat through regular market chains.
- Consumers are becoming aware of the risks associated with residues in meat arising from the use of non-conventional feeds or drugs. This has implications on livestock feeding and management.
- Consumers generally prefer sheep meat and meat from young animals with a trend, mainly among female consumers, towards preference for packaged meat that is normally sold in supermarkets and hypermarkets. Therefore, the growth of supermarkets is expected to increase demand for packaged meat products.

In sum, the main finding from this study is that Tunisian consumers prefer and are willing to pay more for sheep meat from younger animals and packaged meat products. There is also a high demand for health and safety cues such as veterinary control and cleanliness of butchery. This implies that smallholder livestock keepers need to gear production towards these attributes. Public authorities should work towards providing assurance of the safety attributes that consumers prefer and developing relevant animal breeding, feeding and health programs for smallholder livestock keepers.

References

Acebrón LB and Dopico DC. 2000. The importance of intrinsic and extrinsic cues to expected and experienced quality: An empirical application for beef. *Food Quality and Preference* 11(3):229–238.

Albisu LM. 2007a. Quality perception and consumer behaviour. In: Hervieu B (ed), *Mediterra 2007: Identity and quality of Mediterranean foodstuffs*. Centre International des Hautes Etudes Agronomiques Méditerranéennes. Presses de Sciences PO, Paris, France.

Albisu LM. 2007b. Food safety, a market requirement. In: Hervieu B (ed), *Mediterra 2007: Identity and quality of Mediterranean foodstuffs*. Centre International des Hautes Etudes Agronomiques Méditerranéennes. Presses de Sciences PO, Paris, France.

Bartholomew DJ and Knott M. 1999. *Latent variable models and factor analysis.* Arnold, London, UK.

Bernabéu R and Tendero A. 2005. Preference structure for lamb meat consumers: A Spanish case study. *Meat Science* 71(3):464–470.

Bernués A, Olaizola A and Corcoran K. 2003. Extrinsic attributes of red meat as indicators of quality in Europe: An application for market segmentation. *Food Quality and Preference* 14(4):265–276.

Boughanmi H, Al Musalami J, Al-Oufi H and Zaibet L. 2007. Estimating consumer preferences for value-added fish products in Oman: A conjoint analysis. *Journal of Food Products Marketing* 13(2):47–68.

Cattin P and Wittink DR. 1982. Commercial use of conjoint analysis: A survey. *Journal of Marketing* 46(3):44–53.

Darmon RY and Rouziès D. 1999. Internal validity of conjoint analysis under alternative measurement procedures. *Journal of Business Research* 46(1):67–81.

Furnols MF, San Julián R, Guerrero L, Sañudo C, Campo MM, Olleta JL, Oliver MA, Cañeque V, Álvarez I, Díaz MT, Branscheid W, Wicke M, Nute GR and Montossi F. 2006. Acceptability of lamb meat from different producing systems and ageing time to German, Spanish and British consumers. *Meat Science* 72(3):545–554.

García MM, Aragonés Z and Poole N. 2002. A repositioning strategy for olive oil in the UK market. *Agribusiness* 18(2):163–180.

Gilg AW and Battershill M. 1998. Quality farm food in Europe: A possible alternative to the industrialised food market and to current agri-environnemtal policies: Lessons from France. *Food Policy* 23(1):25–40.

Green PE and Rao VR. 1971. Conjoint measurement for quantifying judgmental data. *Journal of Marketing Research* 8(3):355–363.

Green PE and Srinivasan V. 1978. Conjoint analysis in consumer research: Issues and outlook. *Journal of Consumer Research* 5(2):103–123.

Greene W. 2003. *Econometric analysis.* 5th edition. Prentice Hall, Pearson Education, New Jersey, USA.

Grunert KG. 2005. Food quality and safety: Consumer perception and demand. *European Review of Agricultural Economics* 32(3):369–391.

Haddad Y, Haddad J, Olabi A, Shuayto N, Haddad T and Toufeili I. 2007. Mapping determinants of purchase intent of concentrated yogurt (Labneh) by conjoint analysis. *Food Quality and Preference* 18(5):795–802.

Haefele MA and Loomis JB. 2001. Improving statistical efficiency and testing robustness of conjoint marginal valuations. *American Journal of Agricultural Economics* 83(5):1321–1327.

Heinen T. 1996. *Latent class and discrete latent trait models: Similarities and differences.* Sage Publications, Thousand Oakes, California, USA.

Holleran E, Bredahl ME and Zaibet L. 1999. Private incentives for adopting food safety and food quality assurance. *Food Policy* 24(6):669–683.

Lancaster K. 1971. *Consumer demand: A new approach.* Columbia University Press, New York, USA.

van der Lans IA, van Ittersum K, de Cicco A and Loseby M. 2001. The role of region of origin and EU certificates of origin in consumer evaluation of food products. *European Review of Agricultural Economics* 28(4):451–477.

Loader R. 1990. The use of conjoint analysis in the purchase of fruit and vegetables. Unpublished monograph. Department of Agricultural Economics and Management, University of Reading, UK.

Monsón F, Sañudo C and Sierra I. 2005. Influence of breed and ageing time on the sensory meat quality and consumer acceptability in intensively reared beef. *Meat Science* 71(3):471–479.

Montgomery DC. 2001. *Design and analysis of experiments.* 5th edition. John Wiley & Sons, New York, USA.

Ness MR and Gerhardy H. 1994. Consumer preferences for quality and freshness attributes of eggs. *British Food Journal* 96(3):26–34.

Rao AR and Monroe KB. 1988. The moderating effect of prior knowledge on cue utilization in product evaluations. *Journal of Consumer Research* 15(2):253–264.

Shogren JF, Fox JA, Hayes DJ and Roosen J. 1999. Observed choices for food safety in retail, survey and auction markets. *American Journal of Agricultural Economics* 8(5):1192–1199.

Wittink DR and Cattin P. 1989. Commercial use of conjoint analysis: An update. *Journal of Marketing* 53(3):91–96.

Wittink DR, Vriens M and Burhenne W. 1994. Commercial use of conjoint analysis in Europe: Results and critical reflections. *International Journal of Research in Marketing* 11(1):41–52.

Zaibet L. 2007. The quality of agri-foodstuffs in Tunisia: The construction of a strategy. In: Hervieu B (ed), *Mediterra 2007: Identity and quality of Mediterranean foodstuffs*. Centre International des Hautes Etudes Agronomiques Méditerranéennes. Presses de Sciences PO, Paris, France.

Zaibet L and Bredahl M. 1998. Gains from ISO certification in the UK meat sector. *Agribusiness* 13(4):375–384.

Chapter 6   Exploiting markets for dairy and meat products' quality and safety: A Kenyan case study

Stella Makokha[1] and Mohamadou L Fadiga[2]

1. stellamakokha@yahoo.com; research officer at the National Agricultural Research Laboratories, Kenya Agricultural Research Institute, Nairobi, Kenya
2. m.fadiga@cgiar.org; research scientist at the International Livestock Research Institute, Addis Ababa, Ethiopia

Abstract

This study assessed the importance of quality and safety of dairy and meat products to identify strategies for value addition in the milk and meat product markets in Kenya. A rapid market appraisal targeting actors along the meat and milk market chains was conducted to identify the attributes of milk and meat products that consumers sought. Conjoint experiment was used to generate product profiles for milk and meat based on their underlying quality and safety attributes. This was followed by a structured questionnaire applied to households in Nairobi and Eldoret in which consumers were asked to rate the various profiles. The survey results showed that changing consumption patterns for meat and milk are influenced by income. This was especially noted among the middle income households which consumed a wider range of meat products. The study also found for both milk and meat products a higher mean rating for each of their attributes in Nairobi compared to Eldoret. Moreover, while a majority of surveyed consumers found the milk and meat products they consumed to be safe and of good quality, they were still willing to pay more for improved safety and quality attributes.

The relative importance of each quality attribute was evaluated for milk and meat products. For milk, price was the most important attribute as indicated by a higher contribution to overall utility, followed by smell and hygiene. There was some difference between the two cities, as consumers in Eldoret attached more importance to colour while those in Nairobi placed a higher premium on smell. For meat, there was a more balanced contribution of the underlying attributes to overall utility with price, hygiene and official stamp having comparable weights followed by tenderness and fat content.

The derived willingness to pay showed that consumers valued hygiene more than packaging and colour, as they were willing to pay a higher premium for clean milk compared to sealed and creamy milk. Consumers valued smell more than any other attribute given the high premium that non-smelly milk commanded compared to clean milk, creamy milk or milk in a sealed package. For meat, the premium paid for each attribute was variable, with presence

of official stamp commanding a premium of up to Kenya shillings (KES)[1] 71/kg, about one-third of the medium price of meat. The premium for clean meat amounted to KES 56/kg followed by that for soft texture (KES 50) and low fat (KES 31). This pattern was the same in Nairobi and Eldoret although consumers in both cities valued tenderness in a similar fashion, and premiums for cleanliness, low fat content and presence of stamp were, respectively, 17, 21, and 22% higher in Eldoret.

Key words: consumer preference, meat, milk, dairy, quality, safety, Kenya

_____
1. Kenya shillings (KES). In 2009, USD 1 = KES 74.

Introduction

An emerging demand for better quality and safer livestock products because of higher income and increased urbanization has been documented throughout the developing world. A general agreement is that sustaining this demand rests on producers and market agents in the livestock sector in these countries who are expected to respond to the price premiums these desired attributes command in the marketplace. This has the potential to lead to higher and more stable incomes for smallholder producers and could be an avenue for livestock sector development. There are, however, significant technical and institutional barriers that prevent smallholders from fully exploiting these opportunities for value addition. This study was carried out to assess the quality and safety of dairy and meat products and to identify strategies for value addition in the milk and meat product markets in Kenya.

This study had three objectives: (1) to identify changes in consumption patterns of milk and meat products in Kenya; (2) to understand consumer perceptions of meat and milk attributes; and (3) to identify the factors that determine consumer preference for milk and meat attributes and to assess their valuation by consumers. We implemented a sequence of procedures that included preliminary methods such as rapid market assessment (RMA) and conjoint experiments followed by choice-based conjoint analysis.

The study looked at the market from the consumers' perspective to identify what they sought in terms of safety and quality. Various actors along the market chain were interviewed to gain a better sense of what consumers looked for in their purchase decisions for fresh meat and milk products. These patterns of consumption encompass each consumer's individual profile, product attributes and transformation. This is important to facilitate livestock-based product development to meet consumer demand. In this regard, this study addressed the spatial and temporal patterns of product consumption as well as consumer perceptions of the safety and quality status of the products they consumed. The study was conducted in Nairobi, the capital city of Kenya, and Eldoret, a large city located within an agriculturally rich area. Following Crawford (1997), we conducted an RMA in September and October 2006. We focused on actors along the meat and milk market chains to identify the quality and safety attributes of milk and meat products that consumers sought. In total, we interviewed 11 milk producers, 4 beef producers, 8 slaughtermen, 3 producer co-operatives, 150 milk consumers, 88 meat consumers, 44 meat middlemen and 36 milk middlemen. In this context, the term 'middlemen' refers to market intermediaries who do not have any ownership of the transacted product but act as facilitators of market transactions.

We targeted producers and middlemen to identify the attributes they thought buyers looked for in their purchase, and consumers to have a sense of the attributes that influence their purchase decisions. We followed the RMA with a detailed consumer survey using a

structured questionnaire in which respondents were asked questions related to the identified quality and safety attributes, their consumption patterns and the factors that influence their buying decisions. We surveyed 287 randomly selected households: 168 in Nairobi and 119 in Eldoret. The questionnaire sought information on consumer socio-demographic profiles; household consumption patterns; consumers' rating and ranking of the relative importance of individual product attributes and combinations of attributes; and the emerging patterns in consumption of processed meat and milk products and how these patterns related to the consumer's profile.

Market chain actors' perceptions of preferred product attributes

This section is based on the RMA and discusses the quality and safety indicators and their corresponding attributes at the producer, middleman and consumer levels of the milk and meat products market chain.

Indicators of milk attributes

Safety and quality indicators were developed from several sources: the RMA's statements of milk market actors' purchase criteria, required public health standards, the Kenya Dairy Board's practices and local authorities' regulations. Most producers cited good flavour and colour as indicators of good quality. Cream-coloured milk has higher fat content than white milk and was perceived to be of better quality. Different cattle breeds are known to produce milk of different fat contents. For instance, milk from a Friesian cow has lower fat content than that from a Zebu cow. As indicators for quality, middlemen and consumers reported using the lactometer readings and the colour of the milk.

For farmers, the indicators of safety were freshness, level of impurities, level of drug residues and packaging. Housing, hygienic standards, milk handling habits and access to veterinary services were also important. The milk safety indicators for middlemen and consumers were hygienic standards of the milk premises, packaging and freshness of the milk. A market practice was to assess the freshness of raw milk by its smell and that of packaged milk by the expiry date on the packet.

Consumers cited flavour as an indicator of both safety and quality. Some indicators were used by consumers only when the milk was bought and processed. For instance, boiling of milk can reveal adulteration. Some consumers looked to the brand name as an indicator of quality and safety. For consumers who bought raw fresh milk, the source of the milk and the degree to which they trusted their suppliers were indicators of safety and quality. Overall,

more than 70% of the middlemen interviewed said consumers used visual judgement, 15% said consumers used flavour, 12% said consumers used the lactometer and less than 10% said consumers relied upon trust of their suppliers as indicators of milk safety and quality.

Indicators of meat attributes

Meat producers based their indicators of safety and quality on the requirements by buyers and meat inspectors. The indicators of a good quality animal were musculature, breed, age and general body condition. Producers preferred meat from animals reared in certain parts of the country to others because of the perceived superior diet which is thought to influence meat quality.

With respect to quality, 53% of the middlemen indicated that consumers considered fat content and that higher fat content was interpreted as lower quality of meat. About 34% of the middlemen indicated that colour of the meat was the most important attribute to consumers and perceived a light red colour as an indicator of high quality. Other indicators were freshness of the meat, mode of cutting and packaging, and water content, as meat with high water content was considered to be of lower quality.

For meat inspectors, the indicators for safety were general animal health and the animals' last medical treatment. An animal should be healthy with good body weight. For slaughtermen, leanness and tenderness of meat were the quality attributes considered for the final products. A glossy coat was an indicator of a healthy animal. About 28% of the middlemen said that consumers considered the state of hygiene of the premises while 21% said that their customers looked for the official meat inspection stamp on the carcass. Table 6.1 summarizes the quality and safety attributes of milk and meat products that were identified and used in the structured questionnaire and the conjoint experiment.

Table 6.1. *Selected quality and safety attributes for milk and meat*

Products	Attributes	Levels	Values
Milk	Hygiene	2	Clean and unclean
	Packaging	2	Sealed and unsealed
	Colour	2	White and cream
	Smell	2	Smelly and not smelly
	Price (KES/litre)	3	10, 30 and 60
Meat	Hygiene	2	Clean and unclean
	Fat content	2	Low and high
	Official stamp	2	Present and absent
	Tenderness	2	Soft and hard
	Price (KES/kg)	3	140, 210 and 280

Notes: The price values represent the average prices of milk at the low-, middle-, and high income levels collected in the survey. In 2009, USD 1 = KES 74

Generation of orthogonal designs

Table 6.2 shows the orthogonal designs generated from the conjoint experiments with the attributes that were retained and their respective levels. It is based on an orthogonal transformation of the full factorial and is of reduced dimension compared to the full factorial design, which looks at all possible combinations of the attributes and their levels and would give too many profiles for any meaningful ranking by consumers. A full factorial design of five attributes, with four attributes having two levels, and one attribute with three levels gives $2^4 \times 3^1 = 48$ possible profiles to administer to each respondent. There is a great deal of redundancy in the full factorial design, which while rendering their use by consumers almost impossible does not add any information into the design in terms of efficiency. To remedy the problem, we generated a design that precludes colinearity between attributes, which was done through orthogonal transformation that yielded independent profiles. The resulting number of profiles was much lower compared to the full factorial design. The orthogonal designs enhance model efficiency by replacing these exhaustive (but unmanageable) profiles with a reduced number of profiles, which were evaluated by consumers through the survey. Overall, 12 orthogonal designs were generated as the minimum possible design for each commodity.

Table 6.2. *Orthogonal designs for milk and meat attributes*

| Profile | Milk | | | | | Meat | | | | |
	Packaging	Hygiene	Colour	Smell	Price (KES/litre)	Official stamp	Hygiene	Fat content	Tenderness	Price (KES/kg)
1	Sealed	Clean	White	Smelly	10	Absent	Clean	High	Soft	140
2	Sealed	Unclean	Creamy	Not smelly	30	Present	Unclean	High	Hard	210
3	Unsealed	Clean	White	Smelly	10	Absent	Clean	Low	Soft	140
4	Unsealed	Unclean	White	Not smelly	10	Absent	Unclean	Low	Hard	140
5	Sealed	Clean	Creamy	Smelly	10	Present	Clean	High	Soft	140
6	Unsealed	Clean	White	Smelly	30	Absent	Clean	Low	Soft	210
7	Unsealed	Unclean	White	Smelly	30	Absent	Clean	Low	Hard	210
8	Sealed	Unclean	White	Smelly	60	Absent	Clean	High	Hard	280
9	Unsealed	Clean	Creamy	Smelly	10	Present	Clean	Low	Soft	140
10	Unsealed	Unclean	Creamy	Smelly	10	Present	Clean	Low	Hard	140
11	Sealed	Clean	White	Not smelly	10	Absent	Unclean	High	Soft	140
12	Unsealed	Clean	Creamy	Not smelly	60	Present	Unclean	Low	Soft	280

Methods and procedures

The starting point of the choice-based model is the McFadden (1974) random utility framework whereby the utility function at the basis of consumer choice has a deterministic component V_{ij} and a stochastic component, ε_{ij} that is $U_{ij} = V_{ij} + \varepsilon_{ij}$. The stochastic

component accounts for uncertainty due to measurement errors, omitted attributes, discrimination errors and unmeasured preferences (McFadden 1986). We specified the deterministic component of the random utility model as a linear function of attributes and price. More formally we can write:

$$V_{ij} = \sum_n \beta_n x_{ijn} + \gamma_j P_{ij} \text{ with } n = 1,2,..., N; j = 1,2,..., J; \text{ and } i = 1,2, ..., I \qquad (6.1)$$

where x_{ijn} is the nth attribute for product profile j for consumer i, P_{ij} the price of product profile j for consumer i, the parameters β_n are the marginal utilities (also known as part-worth utilities) and γ_j is the marginal utility of price. Let an individual consumer choice set be represented by $C_i = \{1,2,...,J\}$, which contains J alternative profiles. Each respondent is asked to assign a desirability score to each of these profiles. The respondent proceeds by assigning the highest score (say, M) to the most desired profile and the lowest score (say, 1) to the least desired profile. The ordered response model $y_{ij} = \{1,2,...,M\}$ is related to the previously defined latent random utility model U_{ij} in the following way:

$$\begin{cases} y_{ij} = 1 \text{ if } U_{ij} < \alpha_1 \\ y_{ij} = 2 \text{ if } \alpha_1 < U_{ij} \leq \alpha_2 \\ \vdots \\ y_{ij} = M \text{ if } U_{ij} > \alpha_M \end{cases} \qquad (6.2)$$

where $\alpha_1, \alpha_2,..., \alpha_M$ are constant terms that indicate cut-off points. The conditional distribution of the ordered response model is derived by calculating the probability associated with each desirability level (Wooldridge 2002). More formally, the ordered response model can be specified as:

$$\Pr(y_{ij} = m|\mathbf{x}) = \Pr(U_{ij} > \alpha_m) \text{ with } x = \{x_{ijn}, P_{ij}\} \text{ and } 1<m<M \qquad (6.3)$$

Equation 6.3 can be expanded further using the detailed specification of the latent random utility model defined in Equation 6.1, which yields the following equation:

$$\Pr\left(U_{ij} > \alpha_m\right) = \Pr\left(\sum_{n=1}^{N} \beta_n x_{ijn} + \gamma_j P_{ij} + \varepsilon_{ij} > \alpha_m\right) \qquad (6.4)$$

Assuming that the stochastic component ε_{ij} follows a logistic distribution, the ordered response model becomes an ordered logit model and Equation 6.4 can be written using the cumulative logistic distribution function $\Lambda(\square) = \exp(\square)/1 - \exp(\square)$ as follows:

$$\Pr(y_{ij} = m|\mathbf{x}) = \begin{cases} \Lambda(\alpha_1 - \sum_{n=1}^{N} \beta_n x_{ijn} - \gamma_j P_{ij}) \ m = 1 \\ \Lambda(\alpha_m - \sum_{n=1}^{N} \beta_n x_{ijn} - \gamma_j P_{ij}) - \Lambda(\alpha_{m-1} - \sum_{n=1}^{N} \beta_n x_{ijn} - \gamma_j P_{ij}) \ 1<m<M-1 \\ 1 - \Lambda(\alpha_{m-1} - \sum_{n=1}^{N} \beta_n x_{ijn} - \gamma_j P_{ij}) \ m=M \end{cases} \qquad (6.5)$$

In the ordered logit model used to analyse Kenyan consumers' preferences of milk and meat product profiles, we defined the dependent variable in Equation 6.5 as three levels of preference for the 12 product profiles derived from the conjoint experiment. Level 1 corresponded to the least preferred profiles (i.e. profiles rated 1 and 2 in the original questionnaire), Level 2 referred to moderately preferred profiles (i.e. profiles rated 3 in the original questionnaire) and Level 3 corresponded to the more preferable profiles (i.e. profiles rated 3 and 4 in the original questionnaire). These three preference levels were the values taken by the dependent variable in the choice-based conjoint analysis. The independent variables used in the models corresponded to the product attributes stated in Table 6.2 for milk and meat. Following Sy et al. (1993), Adamowicz et al. (1994), and Tano et al. (2003), we categorized the attributes in an effect-coded system whereby the usual (0, 1) dummy system of independent variables was replaced by a (–1, 1) system for two traits and a (–1, 0, 1) system for three traits. The effect-coding system renders empirical interpretation more tractable, especially when deriving the partial utilities that connect the estimated probability choice model to the underlying random utility framework that shapes consumer preference. Price was also included as an independent variable but it retained its continuous nature. The parameters β_n, γ_j and α_m were estimated under this framework and used for further empirical analysis.

With price in the model, consumers' valuation of each quality and safety attribute and their importance (based on their relative contribution to the overall utility each profile provides) was derived. This was achieved by taking the total derivative of Equation (6.1) with respect to that attribute, holding all remaining attributes constant. Setting the resulting equation to zero and solving for the marginal price yielded the willingness to pay for the nth attribute, say WTP_{ijn}, defined as $dP_{ij}/dx_{ijn} = -\beta_n/\gamma_{ij}$. Moreover, the marginal willingness to pay between two different attributes was obtained by simply calculating the difference between their respective values of willingness to pay. Another implication of the ordered logit model is the derivation of the relative importance of each attribute. Because of the effect-coded system, the estimated part-worth utilities were used to derive the utility ranges of each attribute. For price, we followed Baker (1999) and computed the part-worth utility of each price level by multiplying the estimated coefficients of price in the ordered logit models by the corresponding price levels. The relative importance of each attribute, including price, was obtained by dividing its utility range by the sum of all utility ranges of all attributes. All estimations and derivations of consumers' valuation of attributes were conducted at the sample level, at the city level and across household income strata to capture the underlying heterogeneity that shapes consumer demand for milk and meat products in Kenya. This also enabled us to test the underlying hypothesis that urbanization and income are factors that drive the changes in livestock product demand in developing countries.

Results from the consumer survey

Among the surveyed consumers, the average household income was KES 46,000 in Nairobi and KES 30,000 in Eldoret. At the sample level, about 30% of households earned less than KES 10,000, 21% earned KES 10,000–20,000, 20% earned KES 21,000–50,000, about 10% earned KES 51,000–100,000, and 19% earned over KES 100,000 a month. These categories were aggregated into three income groups which were used in the empirical analysis: low income households (earning less than KES 30,000 a month), middle income households (earning KES 30,000–100,000 a month) and high income households (earning over KES 100,000 a month).

There were 16 different milk products consumed across all household income groups. The most widely consumed milk products were raw fresh milk (by 17% of households), packaged pasteurized milk (21%), fermented packaged milk (12%) and yoghurt (13%). In Eldoret, fresh milk was the most popular dairy product while in Nairobi packaged pasteurized milk and yoghurt were the most popular. Although butter and ghee were consumed by less than 5% of the households, the frequency of consumption of these dairy products within the 30 days prior to the survey was quite high (18 times). Among 155 households, yoghurt was the most popular dairy product consumed away from home (27.7%), followed by packaged pasteurized milk (23.2%), ice cream (13.5%), boiled milk (9%) and raw fresh milk (7%).

Cheese and butter were consumed mainly by the high income households, while raw fresh milk was consumed mainly by their low income counterparts. Consumers at the higher end of the low income bracket and at lower end of the middle income bracket mainly consumed packaged pasteurized whole or low-fat milk, ultra-heat treated (UHT) milk, homemade fermented milk and skimmed milk. Consumers at the higher end of the middle income bracket mainly consumed packaged fermented milk, yoghurt, powdered milk, ice cream and camel milk. These consumption patterns for meat and dairy products indicate the influence of income on the type of products consumed.

The surveyed households consumed 18 different types of meat products, the most frequently consumed being eggs (16%), beef with bone (14%), chicken (13%), fish (12%) and goat meat (7%). Turkey and minced meat were consumed mainly by the high income households, while duck was consumed mainly by the low income households. A high proportion of respondents at the higher end of the low income bracket and at the lower end of the middle income bracket consumed beef with bone, cattle offal (e.g. liver), goat meat, mutton, chicken and fish. Households at the higher end of the middle income bracket mainly consumed beef fillet, T-bone steak, corned beef, sausage and pork.

Only 14% of surveyed households reported having eaten fish within the previous 10 years, as did 6% of households for beef and 9% of households for goat meat. Out of 144 consumers, 25% indicated that product availability was the major reason for consuming new products, followed to a lesser extent by affordability and better quality and safety. Among 139 respondents, the main dairy products consumed at the time of the study, but not 10 years previously, were cheese (17%), UHT milk (7.9%), skimmed milk (5.8%) and yoghurt (5.8%). These results illustrate some dynamism in household consumption patterns over the years, which may be due to increased availability and affordability of different dairy products as well as improved quality and safety of the products on offer.

Out of 252 surveyed households, 75% believed that the meat they ate was safe, 15% were not sure and 10% thought it was unsafe. Sixty-three percent of respondents expressed willingness to pay more for improved meat quality, and a similar result was obtained on the question regarding safety. About 63% of respondents believed that the milk they purchased was safe for consumption and 67% said they were willing to pay more for improved milk safety. A similar proportion of surveyed households were willing to pay more for better quality of milk. Overall, while most consumers believed that the meat and milk products they consumed were safe and of good quality, they were also willing to pay more for improved safety and quality of these products.

Consumers rated individual attributes of milk and meat on a scale of 1 (least important) to 10 (most important). The milk attributes rated were hygiene (8.8), smell (8.6), colour (8.0) and packaging (7.9). The mean rating of each attribute was consistently higher in Nairobi than in Eldoret. The respondents in the highest income bracket had the highest mean rating for packaging (8.8), hygiene (8.1), colour (8.4) and smell (9.15). The lowest rating for all the attributes was from the lowest income group. The order of mean rating of meat attributes was hygiene (8.7), tenderness (8.1), stamp (7.6) and fat content (6.5). The respondents in the highest income bracket had the highest mean rating for tenderness (8.5), fat content (7.0), hygiene (9.1) and stamp (8.0). The lowest rating for tenderness, hygiene and stamp was from the lowest income group. The lowest rating for fat content came from the lower end of the middle income group. The mean rating for each of the meat attributes was higher in Nairobi than in Eldoret. Nairobi has had more incidents of food safety and quality issues than Eldoret, which may have influenced the higher rating of quality and safety attributes by consumers in Nairobi.

Results from the estimated ordered response model

The following results summarize the estimation from the ordered logit models and help us gauge the contribution of each quality and safety attribute of fluid milk (hygiene, packaging, colour, smell and price) and meat (hygiene, fat content, official stamp, tenderness and price)

to the overall utility that consumers derive from consuming these products. The relationship between the utility consumers gained from consuming milk and meat products and the ordered logit model was established through Equations (6.1) to (6.5). Thus, the estimated ordered logit model can be used to analyse how the underlying quality and safety attributes of these products impact consumer utility.

Estimates from the ordered logit

As Table 6.3 illustrates, estimation based on the overall sample established that clean, not smelly and cream-coloured milk provided higher utility to consumers than unclean, smelly and white milk, respectively. No significant difference was found between the level of utility from sealed and unsealed packaging, based on the overall sample.

Table 6.3. *Estimated ordered logit models for fluid milk by city*

Variable	Level	Estimate sample	Eldoret	Nairobi
Constant	Constant	0.390 (0.028)	0.476 (0.049)	0.336 (0.035)
Hygiene	Clean	0.601 (0.058)	0.541 (0.091)	0.668 (0.077)
Packaging	Sealed	-0.057^{ns} (0.048)	0.118^{ns} (0.073)	-0.206 (0.066)
Colour	Cream	0.476 (0.052)	0.299 (0.077)	0.624 (0.071)
Smell	Not smelly	1.301 (0.062)	1.346 (0.094)	1.312 (0.085)
Price $\times 10^2$	Price	-6.820 (0.266)	-6.190 (0.391)	-7.460 (0.369)
$-2 \times$ LogL		3420.250	1414.858	1968.823
Wald		343.428	197.801	155.649

Note: Standard errors in parentheses; the dependent variable represents three levels of choice for product profiles (strong preference, moderate preference and weak to no preference); the superscript (^{ns}) indicates non-significance; except where indicated, parameters are significant at the 5% level or better; $-2 \times$ LogL represents the log of the likelihood function; and Wald represents the Wald statistics of joint hypothesis on the parameters, which indicate that the parameters are jointly significant at the 1% level in all three cases.

While similar patterns were generally found for the estimations across cities (Table 6.3) and income strata (Table 6.4), a significant difference was observed between the level of utility from sealed and unsealed packaging in Nairobi and among middle- and high income households. In this case, and unexpectedly, milk in unsealed containers provided a higher level of utility compared to milk in sealed containers. The estimated coefficients of price were negative and significant in all cases as expected, thus conforming to the assumption of these products being normal goods.

For meat, cleanliness, low fat content, presence of official stamp and soft texture had significant and positive impacts on utility derived from consumption. Moreover, there was no difference in terms of direction between the two cities (Table 6.5) or income strata (Table 6.6) and, as expected, the estimated coefficients of price were negative in all cases, confirming the disutility of high prices to consumers.

Table 6.4. *Estimated ordered logit models for fluid milk by income strata*

Variable	Level	Estimate		
		Low income	Middle income	High income
Constant	Constant	0.427 (0.039)	0.388 (0.066)	0.358 (0.065)
Hygiene	Clean	0.420 (0.073)	1.246 (0.151)	0.749 (0.142)
Packaging	Sealed	0.092 (0.062)	–0.274 (0.116)	–0.454 (0.127)
Colour	Cream	0.258^{ns} (0.063)	0.871 (0.142)	0.950 (0.141)
Smell	Not smelly	1.180 (0.074)	2.101 (0.182)	1.235 (0.163)
Price $\times 10^2$	Price	–5.770 (0.313)	–9.120 (0.749)	–9.590 (0.757)
–2 $\times$ LogL		2273.530	715.503	649.417
Wald		503.553	179.896	166.393

Note: Standard errors in parentheses; the dependent variable represents three levels of choice for product profiles (strong preference, moderate preference and weak to no preference); the superscript (^{ns}) indicates non-significance; except where indicated, parameters are significant at the 5% level or better; –2 $\times$ LogL represents the log of the likelihood function; and Wald represents the Wald statistics of joint hypothesis on the parameters, which indicate that the parameters are jointly significant at the 1% level in all three cases.

Table 6.5. *Estimated ordered logit models for raw meat by city*

Variable	Level	Estimate		
		Sample	Eldoret	Nairobi
Constant	Constant	0.818 (0.041)	1.093 (0.081)	0.684 (0.047)
Hygiene	Clean	0.662 (0.051)	0.837 (0.085)	0.568 (0.064)
Fat content	Low fat	0.367 (0.048)	0.479 (0.080)	0.310 (0.060)
Official stamp	Stamp	0.834 (0.045)	1.088 (0.078)	0.695 (0.057)
Tenderness	Soft	0.595 (0.051)	0.701 (0.087)	0.539 (0.064)
Price $\times 10^2$	Price	–1.180 (0.038)	–1.370 (0.067)	–1.090 (0.045)
–2 $\times$ LogL		4101.537	1511.861	2550.476
Wald		1153.580	492.056	659.232

Note: Standard errors in parentheses; the dependent variable represents three levels of choice for product profiles (strong preference, moderate preference and weak to no preference); all parameters are significant at the 5% level or better; –2 $\times$ LogL represents the log of the likelihood function; and Wald represents the Wald statistics of joint hypothesis on the parameters, which indicate that the parameters are jointly significant at the 1% level in all three cases.

Table 6.6. *Estimated ordered logit models for raw meat by income strata*

Variable	Level	Estimate		
		Low income	Middle income	High income
Constant	Constant	1.005 (0.064)	0.626 (0.080)	0.642 (0.075)
Hygiene	Clean	0.782 (0.070)	0.749 (0.118)	0.305 (0.102)
Fat content	Low fat	0.383 (0.065)	0.494 (0.111)	0.271 (0.098)
Official stamp	Stamp	0.983 (0.063)	0.901 (0.103)	0.453 (0.091)
Tenderness	Soft	0.654 (0.070)	0.729 (0.120)	0.406 (0.101)
Price $\times 10^2$	Price	–1.270 (0.053)	–1.270 (0.088)	–0.946 (0.070)
–2 $\times$ LogL		2213.555	820.006	950.533
Wald		682.036	241.191	202.191

Note: Standard errors in parentheses; the dependent variable represents three levels of choice for product profiles (strong preference, moderate preference and weak to no preference); all parameters are significant at the 5% level or better; –2 $\times$ LogL represents the log of the likelihood function; and Wald represents the Wald statistics of joint hypothesis on the parameters, which indicate that the parameters are jointly significant at the 1% level in all three cases.

Relative importance of quality and safety attributes

The parameter estimates of the ordered logit models are the part-worth utilities; they quantify the contribution of each attribute level to the overall utility. The results, expressed in percent, indicate that in the case of milk, price was the most important attribute in determining preference regardless of city or income stratum. The results based on the overall sample indicate that price contributed up to 41% of total utility followed by smell (31%), hygiene (15%), colour (12%) and packaging (1%). The results were similar for Nairobi and Eldoret, except for colour and smell; while these two attributes were, respectively, the second and fourth most important attributes in the two cities, we found a 6% positive gap for Nairobi regarding colour and a 7% positive gap for Eldoret regarding smell (Table 6.3).

The relative importance of these attributes across income strata indicated some similarity in terms of patterns, except for the middle income households for which price and smell had similar weight in determining preference. The importance of price has diminished for the middle income households down to 34% compared to the low income (43%) and high income (41%) households. The relative importance of price as an attribute, especially for the high income households, may be because high price is often perceived as an indicator of high quality and safer products. The importance of hygiene for low income households (35%) was comparable to that of middle income households (31%); both were significantly higher than that of high income households (21%). This result may be explained by the fact that the more affluent consumers bought their milk products from supermarkets where good hygienic practices are implemented in contrast to outlets where most of the less affluent consumers shopped. While the ordered choice model at the sample level revealed that packaging did not play a significant role—which corroborates the lack of importance of this attribute in determining preference—the results based on income strata showed some difference among high income households, for whom this attribute contributed more to their preference compared to low income and middle income households. Figures 6.1 and 6.2 illustrate the relative contribution (in percent) of each attribute to the overall utility at the sample level, in the two cities and across income strata.
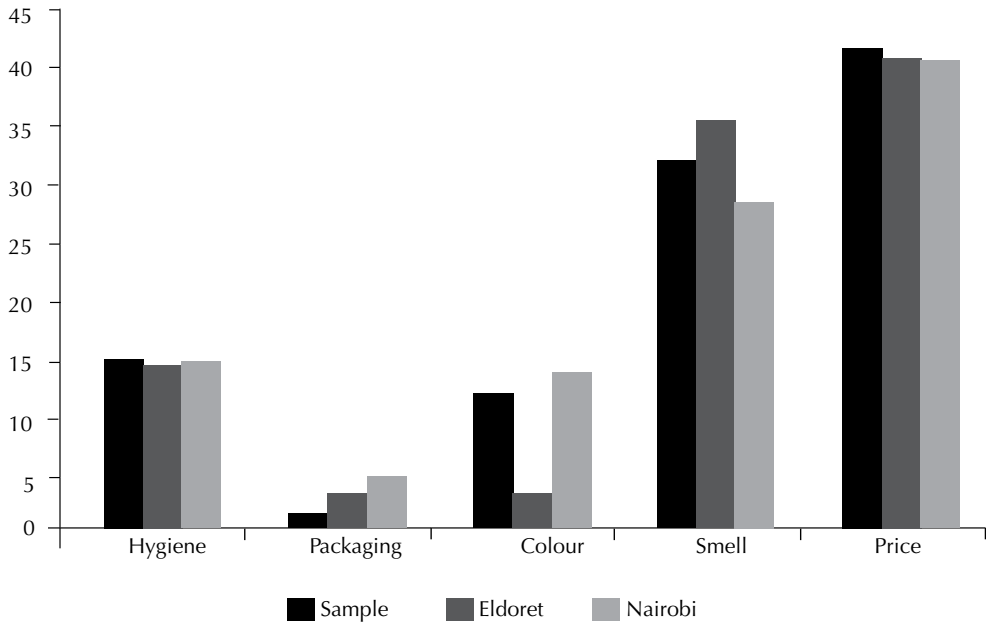
Figure 6.1. *Relative importance (in percent) of quality and safety attributes of milk across the overall sample and cities.*
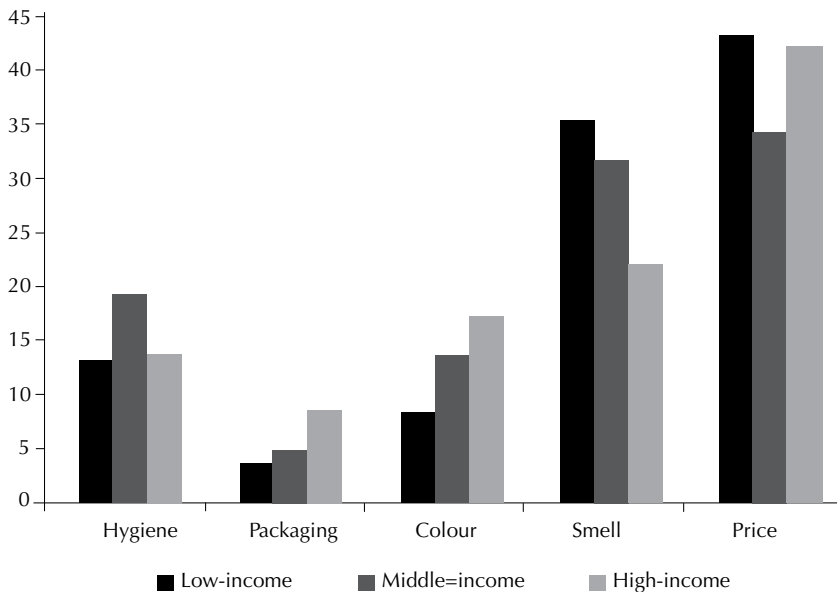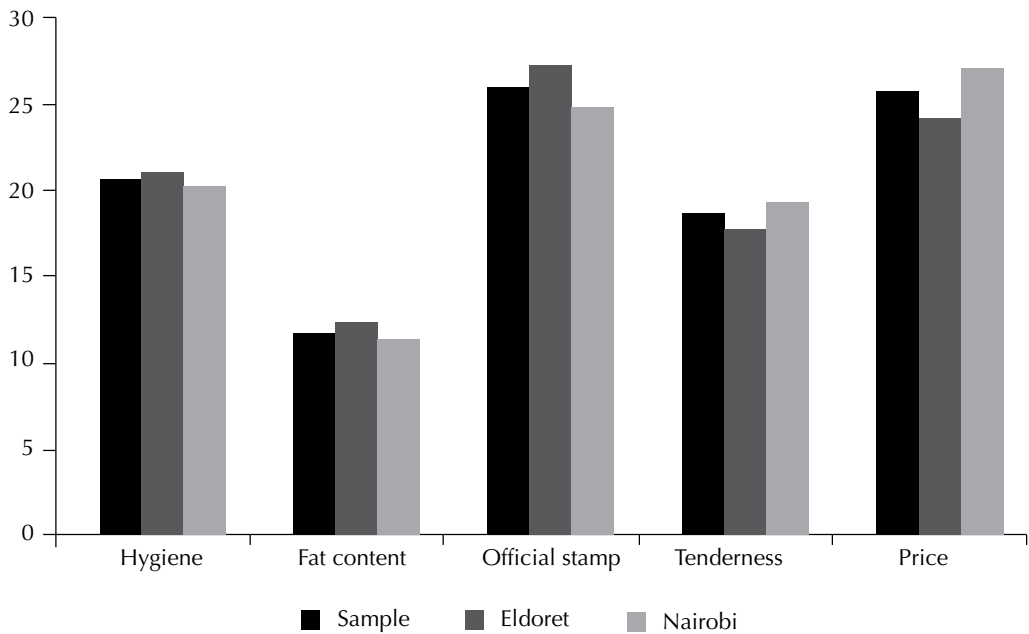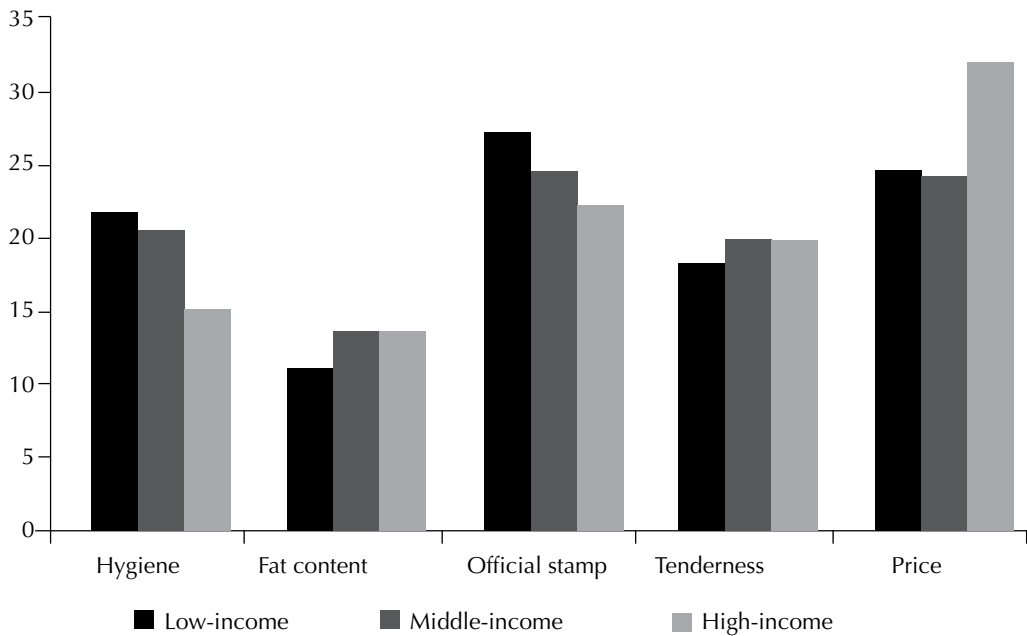

Figure 6.2. *Relative importance (in percent) of quality and safety attributes of milk across income strata.*

Unlike for fluid milk, the importance of various attributes in determining preference for meat was more balanced with price (25%), hygiene (20%) and official stamp (25%) having similar weights based on the entire sample, followed by tenderness (18%) and

fat content (11%). While these patterns were also similar in the two cities, there were some noteworthy differences across income strata. For low income households, price and official stamp were of comparable weight, followed by hygiene, tenderness and fat content. For middle income households, price and official stamp had similar weights as for hygiene and tenderness, but for high income households, price was the most important attribute followed by tenderness and official stamp, which had similar weights, and by hygiene and fat content, which had comparable weights as well. The relative importance of price in its contribution to utility, while appearing counterintuitive, is explained by the fact that it is also an indicator of quality and there is a tendency for consumers to perceive high-priced products as being safer and of better quality than low-priced ones. These results are illustrated in Figures 6.3 and 6.4 and provided at the sample level, in the two cities and across income strata.

Figure 6.3. *Relative importance (in percent) of quality and safety attributes of meat across the overall sample and cities.*

Willingness to pay for quality and safety attributes

Total willingness to pay was derived for each attribute level using the estimated ordered logit models. As Table 6.7 shows, for fluid milk, consumers were willing to pay a premium for creamy, clean milk that was not smelly but not for milk in a sealed package. Based on the overall sample, the premium for milk that was not smelly was three times higher than

that for creamy milk and two times higher than that for milk produced and sold in a clean environment. There was a difference between consumers in Nairobi and Eldoret regarding their valuation of these attributes. While consumers in both cities were willing to pay the same amount in premium for clean milk, Eldoret consumers were willing to pay KES 4/litre more in premium for non-smelly milk while Nairobi consumers were willing to pay about the same amount more in premium for creamy milk.

Figure 6.4. *Relative importance (in percent) of quality and safety attributes of meat across income strata.*

The absolute difference between consumers' valuations of these attributes was also evaluated. These values are termed marginal willingness to pay and are summarized in Table 6.7. These estimates also indicate the relative importance of these attributes in terms of their determining role on consumer preference. From these measures, consumers valued hygiene more than packaging and colour, as they were willing to pay a higher premium for clean milk than creamy milk or milk in a sealed package. Consumers assigned more importance to smell than to any other attribute, as shown by the high premium that non-smelly milk commanded compared to clean milk, creamy milk or milk in a sealed package. This corroborates its prominence in shaping preferences for milk, as indicated in our findings about the relative importance of each quality attribute in shaping consumer preference for fluid milk. Except for differences in magnitude, the general patterns of the results remain the same for the two cities and across income strata.

Table 6.7. *Estimated willingness to pay (KES/litre) for quality and safety attributes of fluid milk across cities and income strata*

	Sample	Eldoret	Nairobi	Low income	Middle income	High income
Willingness to pay						
Clean vs. unclean	8.82	8.75	8.96	7.28	13.66	7.81
Sealed vs. unsealed	−0.84	1.90	−2.76	1.60	−3.00	−4.73
Creamy vs. white	6.99	4.84	8.37	4.48	9.55	9.90
Smelly vs. not smelly	19.07	21.74	17.58	20.45	23.03	12.88
Marginal willingness to pay						
Clean vs. sealed	9.66	6.84	11.72	5.68	16.66	12.54
Clean vs. creamy	1.83	3.91	0.59	2.81	4.11	−2.09
Clean vs. not smelly	−10.25	−13.00	−8.62	−13.17	−9.37	−5.06
Sealed vs. creamy	−7.83	−2.93	−11.13	−2.88	−12.56	−14.63
Sealed vs. not smelly	−19.91	−19.84	−20.34	−18.85	−26.04	−17.60
Creamy vs. not smelly	−12.08	−16.91	−9.21	−15.97	−13.48	−2.97

The values of derived willingness to pay for meat quality and safety attributes are summarized in Table 6.8.

Table 6.8. *Estimated willingness to pay (KES/kg) for quality and safety attributes of raw meat across cities and income strata*

	Sample	Eldoret	Nairobi	Low income	Middle income	High income
Willingness to pay						
Clean vs. unclean	56.13	61.09	52.11	61.60	58.98	32.19
Low fat vs. high fat	31.12	34.94	28.44	30.16	38.92	28.64
Stamp vs. no stamp	70.69	79.45	63.76	77.40	70.92	47.90
Soft vs. hard	50.43	51.18	49.48	51.48	57.37	42.95
Marginal willingness to pay						
Clean vs. low fat	25.01	26.15	23.67	31.44	20.06	3.55
Clean vs. stamp	−14.56	−18.35	−11.65	−15.80	−11.94	−15.71
Clean vs. soft	5.69	9.91	2.63	10.12	1.61	−10.76
Low fat vs. stamp	−39.57	−44.50	−35.32	−47.24	−32.00	−19.26
Low fat vs. soft	−19.31	−16.24	−21.04	−21.32	−18.45	−14.31
Stamp vs. soft	20.25	28.26	14.28	25.92	13.55	4.95

Respondents were willing to pay premiums for cleanliness, low fat content, presence of official stamp and tenderness. Based on the overall sample, the presence of official stamp commanded a KES 71/kg premium, about one-third of the medium price of meat. The premium for clean meat amounted to KES 56/kg followed by that for soft texture (KES 50) and low fat (KES 31). This pattern was the same in Nairobi and Eldoret though the magnitudes were different. Except for tenderness, which was valued similarly in both cities, price premiums for cleanliness, low fat content and presence of stamp were, respectively, 17, 21, and 22% higher in Eldoret. The general pattern of results changed across income strata. For

instance, low income households' valuation of these attributes was, by and large, similar to the findings based on the overall sample. However, middle income households valued tenderness and hygiene similarly but less than official stamp by nearly 21% while high income households valued hygiene and fat content equally and official stamp and tenderness as well.

Conclusions and implications

This study is one of the first attempts to comprehensively assess the nature of demand for quality and safety of meat and milk products in Kenya. It employed analysis of several aspects to assess consumption patterns and changes over time, and views on quality and safety and their provision. An innovative approach was taken to RMA-based assignment of importance to safety and quality criteria and attributes; market actors were asked which attributes their buyers demanded.

All sampled actors in Kenyan meat and milk markets expressed strong and clear views on the quality and safety attributes demanded by their buyers. Moreover, these views were consistent across producers, middlemen, consumers and other actors. Such views provide a strong basis for specification of choice experiments, and this study formally applied this method of definition of explanatory variables in demand by means of an RMA.

Definition of quality and safety was not pursued in the research, but delineation between these characteristics was possible based on the RMA. This was, in turn, able to be utilized in the analysis of willingness to pay for attributes that could be classified as either safety or quality attributes. The study found that consumers were willing to pay more for safety than quality of milk. This was found in both Nairobi and Eldoret and across income strata, which for the most part followed a similar pattern in terms of ranking but with different magnitudes. This heterogeneity in consumer valuation of safety and quality attributes will be useful to livestock marketing practitioners and development experts.

Consumers claimed to be satisfied with the quality of Kenyan meat and milk products. Moreover, they were willing to pay a premium for improved levels of quality and safety. The apparent changes in consumption (based on consumer recall over a 10-year interval) due to improved availability did not explain this apparent premium, as all analyses indicated the expected negative price elasticities.

Some intriguing results emerged with respect to consumption patterns of high income households; we found these to be less diversified than those of middle income households, possibly due to the former's demand for high standards for all products, so restricting themselves to eating just a few products. However, the low income households were also

restricted to a few products, perhaps because of their lower purchasing power. The high income households may also have had access to non-livestock sources of protein and fat, and so consumption of livestock products was less diverse than among middle income households. In general, as income increased, consumers demanded more processed products and attached more importance to safety and quality. However, the results that were generated appear to contradict this assertion for the high income consumers for whom hygiene had a lower weight. This could be because these consumers shop in high-end grocery stores where these safety issues have already been addressed in the procurement systems and in the systematic use of safer handling practices.

Income levels and urbanization were shown to be the sources of significant differences in current consumption patterns and willingness to pay. However, the robustness across the entire data set of the models estimated indicates that preferences were somewhat uniform across consumers and changes in income and urbanization are likely to be associated with demand changes as predicted by the increasing body of evidence concerning livestock products' consumption throughout the developing world.

The results also showed that the low income households consumed fresh milk more often than the other income groups and yet, except for smell, they did not rate safety and quality of the product as highly as did the middle- and high income households. The reason may be found in a systematic practice by low income consumers consisting of boiling milk before consumption. For this reason, the concerns for safety and quality are minimized and this is how the informal milk market maintains its role as a major player in the milk distribution channel.

The quality and safety attributes identified in the RMA, found to be important in the consumer surveys and significant in the conjoint experiment, are readily able to be delivered by the Kenyan meat and milk market systems. There is potential for value addition by smallholder meat and milk producers, in that key attributes of quality (e.g. milk and meat colour) and safety (e.g. freshness and cleanliness) are indeed able to be produced and supplied by these farmers.

Two types of barriers might present themselves; first, that incentives are insufficient at farm level and second, that the attributes are not being preserved along the chain. In both cases, transmission of incentives is an issue. The general agreement amongst actors at all chain stages about desired attributes suggests that transmission problems are not due to lack of information. A matter for further research is the behaviour of actors in the chain and the size and nature of transaction costs which may overshadow the incentives identified here.

The extent to which trust of trading partner influences trade volumes along the chain was not examined in this study. However, consumers overwhelmingly claimed not using trust as an indicator of product quality and safety. This indicates that, at consumer level, there is a demand for objective measures of quality and safety as evidenced by high willingness to pay for quality stamps and information displayed on packages. Good packaging gives information about the quality of the product and assures the consumer of product safety. Taken together, these factors indicate a role for grades and standards in the Kenyan meat and dairy industries.

The study has shown how income and location have influenced consumer perceptions of quality and safety. Subsequent consumer studies should include other factors like education, age and gender to have a comprehensive understanding of consumer behaviour. As incomes increase, consumers become more wary of the safety and quality aspects and tend to only buy from particular places that meet these standards. The only way suppliers can access these markets is to meet the standards.

This study relied primarily on visual product attributes. Presence of antibiotic residues in milk and meat, though not mentioned among the attributes, is very important to safety. In this regard, consumers should be made aware of the risks of consuming products with such unseen and undesirable attributes, as these products may be bought from informal sources. In formal channels, milk and meat products are inspected by regulatory authorities to address these unseen attributes. Consumers should be sensitized to demand certain levels of quality and safety. Areas where improvements are needed should be made clear to consumers in case they are sold substandard products.

References

Adamowicz W, Louviere J and Williams M. 1994. Combining revealed and stated preference methods for valuing environmental amenities. *Journal of Environmental Economics and Management* 26:271–292.

Baker GA. 1999. Consumer preference for food safety attribute in fresh apple: Market segments, consumer characteristics, and marketing opportunities. *Journal of Agricultural and Resource Economics* 24(1):80–97.

Crawford IM. 1997. Marketing research and information systems. In: FAO (Food and Agriculture Organization of the United Nations), *Marketing and Agribusiness Texts No. 4.* Agricultural Support Systems Division, FAO, Rome, Italy. 121 pp.

McFadden D. 1974. Conditional logit analysis of qualitative choice behavior. In: Zarembka P (ed), *Frontiers in econometrics.* Academic Press, New York, USA. pp. 105–142.

McFadden D. 1986. The choice theory approach to market research. *Marketing Science* 5(4):275–297.

Sy HA, Faminow MD, Gary VJ and Gary C. 1993. Estimating the value of cattle characteristics using an ordered probit model. Paper presented at the 1993 CAEFMS annual meeting, Edmonton, Canada, 11–14 July 1993.

Tano K, Kamuanga M, Faminow MD and Swallow B. 2003. Using conjoint analysis to estimate farmers' preferences for cattle traits in West Africa. *Journal of Ecological Economics* 45:393–407.

Wooldridge J. 2002. *Econometric analysis of cross-sectional and panel data.* MIT Press, Cambridge, Massachusetts, USA.

Chapter 7   Consumer preferences and willingness to pay for improved quality and safety: The case of fresh camel milk and dried camel meat (*nyir nyir*) in Kenya

Francis Wanyoike,[1] Simeon Kaitibie,[2] Simon Kuria,[3] Anne Bruntse,[4] Isaac Njoro Thendiu,[5] David Miano Mwangi[6] and Amos Omore[7]

1. f.wanyoike@cgiar.org; research assistant at the International Livestock Research Institute (ILRI), Nairobi, Kenya

2. s.kaitibie@cgiar.org; was a research scientist at ILRI, Nairobi, Kenya and is currently a research scientist at the International Centre for Agricultural Research in the Dry Areas (ICARDA), Aleppo, Syria

3. simongkuria@yahoo.com; director of the Marsabit Centre of the Kenya Agricultural Research Institute (KARI), Marsabit, Kenya

4. abruntse@ymail.com; member of the Kenya Camel Association, Nairobi, Kenya

5. injoro@allpro.go.ke; market and business development officer of the Arid and Semiarid Lands Based Livestock and Rural Livelihoods Support Project and an assistant director in the Ministry of Livestock Development, Nairobi, Kenya

6. dmmwangi@kari.org; assistant director of animal production research at KARI, Nairobi, Kenya

7. a.omore@cgiar.org; research scientist at ILRI, Nairobi, Kenya

Abstract

It has been hypothesized that small-scale livestock producers and market agents do not fully exploit high-value niche markets due to their inability to meet safety and quality requirements. This paper presents the results of a study on the safety and quality attributes preferred by consumers of fresh camel milk and dried camel meat (*nyir nyir*) in Kenya and their willingness to pay for these attributes. Consumers were willing to pay relatively high price premiums for preferred quality attributes, demonstrating that opportunities exist for suppliers of camel meat and milk to improve their returns by improving the quality of products sold in conventional and niche markets. Full exploitation of these opportunities will require innovative market linkages to be developed that address specific consumer demands. Identifying food safety barriers through this approach provides a clear justification for embarking on risk analysis to address the barriers where they are associated with distinct hazards.

Key words: demand, quality, safety, willingness to pay, camel milk, camel meat

---

Introduction

Camel milk is important in the diets of communities in the arid and semi-arid regions of northern and eastern Kenya where the prevailing climate adversely affects milk production by other livestock species. An average female camel produces five to ten times more milk than a cow under similar conditions, partly due to its prolonged lactation. It is estimated that Kenya's camel population has increased from 600,000 to 900,000 in the last 20 years and camel rearing has expanded from the arid to semi-arid areas like Samburu, Laikipia, Wajir and the Rift Valley, and more recently to Maasailand, Taita Taveta, Kilifi and Kajiado (Chabeda 2002). These changes have also led to increased production of camel milk which is increasingly being traded in local markets as well as distant urban markets in Nairobi and other provincial towns.

During the rains, the extent of marketable surplus production increases but problems of transport and milk hygiene abound. Consequently, the distant markets remain inaccessible to producers and the milk either fetches low prices or is wasted because of deterioration of quality. Besides the problems related to poor quality, it is not well understood if the problems of accessing urban niche markets can be overcome by establishing improved market infrastructure including collection points in district towns in the arid and semi-arid regions or by milk processing (chilling, pasteurizing or fermenting) to add value and prolong shelf-life. Understanding these problems requires an appreciation of the nature of demand, including price premium, for good quality milk and opportunities for value addition in contrasting market locations.

Camel meat is an important by-product and source of income. Demand for camel meat in urban centres such as Nairobi is rising, fuelled by increasing immigration by communities that traditionally consume camel products such as *nyir nyir*, a traditional product made by cooking strips of camel meat then drying them and preserving in oil. Spices may be used during cooking. Some women's groups in Garissa make *nyir nyir* for sale to traders and consumers in distant towns such as Nairobi. Camel meat production and marketing is therefore becoming increasingly commercialized. Camel meat markets probably have problems of a different nature to markets for camel milk, but the nature and extent of demand for these products and the locations of their markets are not well known.

Against this background, this study was undertaken to generate information on the nature of demand for fresh camel milk and *nyir nyir*, with a focus on consumer preference and demand for safety and quality attributes of these products.

Materials and methods

Conjoint analysis

Conjoint analysis was used to evaluate consumer preference and willingness to pay for safety and quality attributes of fresh camel milk and *nyir nyir*. The Lancastrian consumer theory was used as the basis for measuring willingness to pay; the theory contends that a commodity has a bundle of characteristics or attributes which give utility to the consumer rather than the commodity itself (Lancaster 1966).

Marjon and Ryan (1996) present five stages in designing a conjoint analysis as follows: (1) determining what attributes to include in the analysis, (2) assigning levels to the identified product attributes, (3) establishing which scenarios to present to respondents, (4) establishing preferences and (5) estimating total and marginal utilities, marginal rates of substitution between attributes and willingness to pay, if cost is included as an attribute.

To identify which product attributes consumers consider when buying fresh camel milk and *nyir nyir*, a rapid appraisal was carried out prior to the formal survey and discussions held with key informants (researchers, officials from Kenya's Ministry of Livestock Development, traders and consumers). Milk market agents said that the quality of fresh camel milk was affected by various factors such as poor hygiene; use of dirty containers; delayed milk delivery; lack of refrigeration; adulteration with leftover milk, milk from other livestock species or water; failure to observe milk withdrawal periods; mastitis and flavour contamination from smoke. Factors affecting the quality of *nyir nyir* were identified as the use of dirty containers and packaging materials; contamination with dust while selling in the open; unhygienic product handling during processing and marketing; prolonged storage at high temperatures; inadequate oil and low quality of the raw meat. Failure to adequately dry the meat resulted in rapid spoilage.

Thus, the attributes of fresh camel milk included in the analysis were freshness, packaging, adulteration, colour and price. The respective levels of the attributes were as follows: fresh and non-fresh; packaged and unpackaged; adulterated and pure; creamy and white; and KES 15, 30 and 60/litre. The attributes of *nyir nyir* included in the analysis were fineness of cut, tenderness, spicing, cleanliness of premises where the product was sold and price. The respective levels of the attributes were as follows: small and large; soft and hard; spiced and unspiced; clean and unclean; and KES 125, 250 and 300/kg.

To generate the profiles presented to respondents for evaluation, the product attributes were combined, with each attribute appearing at each of its levels for each profile. Although all possible product profiles needed to be studied, this would have resulted in a very large number of profiles ($2^4 \times 3^1 = 48$ profiles for each product). Individuals cannot answer reliably

to more than 16 conjoint questions (Permain et al. 1991). Therefore, the number of profiles was reduced to a more manageable level (12 for each product) using orthogonal main effect experimental design. Table 7.1 presents examples of profiles that represent combinations of different levels of attributes of *nyir nyir*.

Table 7.1. *Examples of product profiles representing combinations of different levels of attributes of* nyir nyir

Profile number	Fineness of cut	Tenderness	Spicing	Premises	Price (KES)
1	Small	Soft	Unspiced	Clean	125
2	Small	Hard	Spiced	Unclean	250
3	Large	Soft	Unspiced	Clean	125
4	Large	Hard	Unspiced	Unclean	125

Orthogonal main effect designs are attractive as they tend to be small in size even when the number of the attributes and their levels are large, avoid multicolinearity between the attributes, allow for a consistent estimation of the effect of all attributes independently from each other and characterize the estimated coefficients with minimum variance (Green 1974; Kuhfeld et al. 1994).

To establish preferences, the respondents were asked to rate each profile on a scale from 1 (lowest preference) to 5 (highest preference). To determine the effect of the attributes on preference, a linear additive utility model was used which assumes that the overall utility from a set of attributes of a given good is the sum of the separate part-worths of the attributes. The utility model was specified as:

$$U = \beta X + e \qquad\qquad (7.1)$$

where U is a vector matrix of scores for different scenarios by the consumers; X is a matrix of product attributes (and other factors) influencing the utility that can be derived from different scenarios by different consumers; β is a vector of unknown parameters to be estimated; and e is a stochastic random term with mean = 0 and variance = σ^2.

Given the ordinal nature of the dependent variable, i.e. the 5-point scale on which the utility/preference score was measured, an ordered probit model was used to estimate the coefficients. Ordinary Least Squares (OLS) estimation could not be used as it assumes cardinal utility which supposes that intervals between consecutive scores have the same utility difference. Also, as the utility ratings are bounded from below and above, OLS would yield asymmetrically truncated coefficients and biased regression estimates (Marjon and Ryan 1996). The marginal rate of substitution (MRS) between two attributes, say X_a and X_b, can be calculated as:

$$MRS = \frac{\partial U / \partial X_a}{\partial U / \partial X_b}$$

The MRS in this context shows the level of attribute X_b that the consumer is willing to give up for a unit change in attribute X_a. In a linear additive utility model $\partial U / \partial X_a$ is the parameter estimate for the variable X_a while $\partial U / \partial X_b$ is the coefficient for the variable X_b. If X_b is the price, then the MRS is actually the marginal willingness to pay for a unit change in attribute X_a.

Data collection

Data were collected from a random sample of 360 households, 180 in Eastleigh, Nairobi and 180 in Garissa. These locations were selected because they are major consumption centres for camel milk and meat. To identify the survey households, a two-stage sampling procedure was used. During the first sampling stage, residential areas were grouped into high-, medium- and low income categories. Subsequently, two residential areas were randomly selected from each category in each study site. In the second sampling stage, a systematic approach was used to select households where interviews were conducted. This involved drawing a map of each of the selected residential areas highlighting major landmarks (e.g. churches, schools, shopping centres, petrol stations) and roads. Transects were then drawn between pairs of randomly selected landmarks. Starting from one end of the transect, every fifth household on alternate sides of the transect (or a path that closely followed it) was visited and the household head and/or their spouse interviewed by use of a structured questionnaire.

Results

Consumption patterns of camel milk and meat products

Most of the surveyed households were either from the Somali ethnic community (85% in Eastleigh and 91% in Garissa) or the Borana, Gabbra and Rendille ethnic communities (7% in Eastleigh and 2% in Garissa). Consumption of camel milk and meat was less prevalent in Eastleigh (54% and 82% of households for the respective products) than in Garissa (85% and 90%). Only 56% of Somali households in Eastleigh consumed camel milk products compared to over 90% in Garissa. Likewise, 13% of Somali households in Eastleigh did not consume camel meat products compared to only 3% in Garissa.

Raw fresh camel milk was the most frequently purchased camel milk product, with over 90% of households in Garissa and Eastleigh having purchased it during the month prior to the study. Fifty percent of households in Garissa and 44% in Eastleigh that had purchased camel

milk products during the month prior to the survey cited street vendors as the source. Only a low proportion of households purchased formally processed camel milk products such as packaged fermented camel milk (13% in Eastleigh and 4% in Garissa), packaged pasteurized camel milk (7% in both sites), ultra-heat treated camel milk (8% in Eastleigh and 3% in Garissa), and packaged pasteurized low-fat camel milk (8% in Eastleigh and 3% in Garissa). Prices of formally processed camel milk products were higher than those of camel milk products sold by informal market agents. For instance, one litre of packaged pasteurized fresh camel milk was sold at an average of KES 159 compared to KES 84 for a litre of informally sold raw camel milk. It is important to note the seasonality of the consumer price of camel milk. Results of a rapid appraisal conducted prior to the formal survey showed that prices tended to be high during the dry season when milk supply is low and low during the wet season when milk supply increases.

The most frequently cited factors influencing choice of market outlet for camel milk products were proximity of outlet to the consumers' homes (58% of consumers in Garissa and 51% in Eastleigh), consumer knowledge of or trust in the seller (46% of consumers in Garissa and 36% in Eastleigh) and consumer perception of product quality and safety (34% of consumers in Garissa and 12% in Eastleigh). Quality and safety considerations may, however, be confounded in the extent to which the buyer knows and/or trusts the seller. In Eastleigh for instance, some respondents said that they chose to buy milk only from sellers whom they knew well or trusted in order to avoid buying poor quality and potentially unsafe milk. They added that trusted sources were important since urban consumers could hardly tell how well the camel milk had been handled during transport to Nairobi.

While most of the households that had consumed camel meat during the preceding month had purchased fresh camel steak (86% of households in Garissa and 75% in Eastleigh) or fresh camel meat with bone (about 60% of households in Garissa and 44% in Eastleigh), some households had also bought *nyir nyir* (about 54% of households in Eastleigh and 37% in Garissa). Between 56% and 79% of households in Eastleigh that bought *nyir nyir* sourced it from street vendors while 60% of households in Garissa that bought *nyir nyir* sourced it from local butcheries. These sellers often procured the *nyir nyir* from individual or group suppliers including women and women's groups who prepare the product. Proximity of market outlets to consumers' homes and quality and safety considerations were the most frequently cited reasons for choice of market outlet for camel meat products. As for purchase of camel milk, consumers in Eastleigh said that their choice of market outlet depended on how well they knew and trusted the sellers so as to avoid poor quality and potentially unsafe *nyir nyir*.

Willingness to pay for safety and quality attributes of camel milk and *nyir nyir*

During an attempt to separate quality from safety attributes, it was found that some of the characteristics were cited in both sets of attributes, demonstrating that the two attribute categories are difficult to separate from one other. Moreover, even within each of the sets of quality and safety attributes, consumers at times used one attribute or a number of them to help gauge the level of another. For instance, the taste of camel milk was often used as a proxy to assess its freshness. Table 7.2 presents the ordered probit model estimates of the determinants of preference for fresh camel milk.

Table 7.2. *Ordered probit parameter estimates of determinants of preference for fresh camel milk*

Variable	Level	Eastleigh		Garissa	
		All tribes	Somali	All tribes	Somali
Freshness	Fresh	1.1731**	1.2085**	1.5279**	1.5020**
		(0.0778)	(0.0822)	(0.0606)	(0.0614)
Adulteration	Pure	0.5814**	0.4569**	1.5009**	1.4831**
		(0.0803)	(0.0842)	(0.0631)	(0.0639)
Colour	White	−0.0005ns	−0.0030ns	−0.1262*	−0.1227*
		(0.0735)	(0.0776)	(0.0551)	(0.0560)
Packaging	Packaged	0.5475**	0.5787**	0.7725**	0.7896**
		(0.0818)	(0.0867)	(0.0613)	(0.0624)
Price	Continuous	−0.0145**	−0.0143**	−0.0081**	−0.0078**
		(0.0027)	(0.0028)	(0.0020)	(0.0021)
Unrestricted log-likelihood value		−1312.7	−1168.3	−2215.4	−2153.6
Restricted log-likelihood value		−1452.2	−1296.4	−2763.2	−2673.5
Likelihood ratio test (χ^2)		279.1	256.1	1095.6	1039.7
Percent of correct predictions		66.4	67.5	76.2	76.3

Standard errors in parentheses.
*Significant at 95%; **Significant at 99%.

Respondents derived higher utility from milk that was fresh, unadulterated and packaged. The whiteness of milk was not an important quality attribute, perhaps a reflection of the sophistication of the respondents who know that pure camel milk is always white. The price variable, which was treated as continuous in the analysis, was expectedly negative in conformity with properties of the demand function for a normal good and was statistically significant. Premiums of willingness to pay were positive and relatively high. Respondents in both study sites were willing to pay the highest price for freshness of milk than for any other attribute. In Eastleigh, willingness to pay for freshness was KES 81/litre, almost twice as much as that for unadulterated milk (KES 41/litre) and for packaged milk (KES 38/litre). In Garissa, the willingness to pay for freshness was KES 189/litre, unadulterated milk KES 185/litre and

packaged milk KES 95/litre. Consumers showed a disutility for colour, as reflected in the negative values of the estimates of willingness to pay.

For *nyir nyir*, results of the ordered probit model showed that consumers derived higher utility from meat that is fine chop, tenderness and cleanliness of premises (Table 7.3). The rural–urban divide was evident regarding preference for spicing, with respondents in rural Garissa deriving significantly higher utility from spicing while urban respondents in Eastleigh showed disutility for this attribute. Like camel milk, price had a significant negative effect on preference of *nyir nyir*.

Table 7.3. *Ordered probit parameter estimates of determinants of preference for* nyir nyir

Variable	Level	Eastleigh		Garissa	
		All tribes	Somalis	All tribes	Somalis
Fineness of cut	Small	0.6737**	0.7569**	0.9285**	0.9313**
		(0.0763)	(0.0824)	(0.0694)	(0.0700)
Tenderness	Soft	0.4357**	0.3972**	0.9358**	0.9347**
		(0.0749)	(0.0806)	(0.0669)	(0.0675)
Spicing	Spiced	−0.2296**	−0.2200**	0.8200**	0.8270**
		(0.0718)	(0.0772)	(0.0650)	(0.0656)
Premises	Clean	1.0580**	0.9297**	1.5075**	1.4880**
		(0.0798)	(0.0847)	(0.0729)	(0.0734)
Price	Continuous	−0.0036**	−0.0038**	−0.0050**	−0.0049**
		(0.0003)	(0.0003)	(0.0003)	(0.0003)
Unrestricted log-likelihood value		−1432.8	−1246.5	−1577.1	−1550.8
Restricted log-likelihood value		−1699.7	−1467.6	−2205.6	−2166.3
Likelihood ratio test ($\chi 2$)		533.8	442.2	1256.9	1231.1
Percent of correct predictions		73.6	72.4	82.2	82.1

Standard errors in parentheses.
[*]Significant at 95%; [**]Significant at 99%.

The willingness to pay for quality and safety attributes in *nyir nyir* was relatively high, pointing towards some potential for processors and sellers of this product to earn better prices by improving the attributes desired by consumers. Willingness to pay was highest for cleanliness of premises than for any other attribute most probably because *nyir nyir* is sold as a processed, ready-to-eat food commodity. There seemed to be some differences in taste preference in the two study sites with consumers in Eastleigh showing a disutility for spicing (manifested by a negative value of willingness to pay) unlike their counterparts in Garissa who had a positive premium for the attribute.

Discussion

This study yielded some results which appear to go against widely observed trends documented by Delgado et al. (1999) that urbanization is associated with higher

consumption of meat products. For example, there was less widespread consumption of camel milk and meat in Eastleigh, an urban location, compared to Garissa, a small rural town. However, this may be due to inefficiency in the performance of the value chains that deliver these products from the production areas to potential consumers in distant urban markets or because in urban centres, choices exist for other meat and milk products. Although information on reasons for non-consumption was not collected during the survey, the pre-survey rapid appraisal found that reasons cited for non-consumption not only included lack of awareness and negative attitudes toward camels and camel products but also lack of access and concerns over quality and safety of the products.

Overall, the results demonstrate the dominance of informal market agents in delivering camel milk products and *nyir nyir* to consumers in major demand centres in Kenya. The results also confirm that safety and quality considerations play an important role in influencing consumers' decisions on whether and where to buy these products. Moreover, the results of willingness to pay for safety and quality indicate that there is scope for informal market agents and farmers to realize better prices through quality improvement.

Recommendations

Having demonstrated that food safety is a barrier, the challenge for resolving the issue remains. A widely acceptable approach is risk analysis, which incorporates the elements of hazard identification, risk assessment and risk communication. In this particular case, risk analysis may focus on common hazards associated with poor hygiene, or communication (including training) based on literature knowledge of associated hazards and ways to mitigate their effects.

Given the importance of informal market agents as sources of camel milk for consumers, efforts that seek to improve the performance of camel milk marketing should target to involve them. From experience in dairy marketing in Kenya, provision of training in hygienic handling and value addition is a viable way of enabling these market actors to be able to meet the existent demand for safe and quality products thereby making them earn better returns from their activities. Similarly, provision of training in hygienic processing and handling of *nyir nyir* to processors and vendors (who are important outlets in Nairobi) could be a viable way of enhancing quality and safety. In addition, packaging and labelling could help overcome current consumer concerns.

References

Chabeda AEO. 2002. The past, present and future extension on camel production in Kenya. Paper presented at the eighth Kenya Camel Forum held at Mile 46, Kajiado, Kenya, 11–15 March 2002.

Delgado C, Rosengrant M, Steinfeld H, Ehui S and Courbois C. 1999. *Livestock to 2020: The next food revolution.* Food, Agriculture and the Environment Discussion Paper No. 28. FAO (Food and Agriculture Organization of the United Nations), Rome.

Green PE. 1974. On the design of choice experiments involving multifactor alternatives. *Journal of Consumer Research* 1(1):61–68.

Kuhfeld WF, Tobias RD and Garratt M. 1994. Efficient experimental design with marketing research applications. *Journal of Marketing Research* 31(4):545–557.

Lancaster K. 1966. A new approach to consumer theory. *Journal of Political Economy* 74:132–157.

Marjon P and Ryan M. 1996. Using conjoint analysis to establish consumer preferences for fruit and vegetables. *British Food Journal* 98(8):5–12.

Permain D, Swanson J, Kroes E and Bradley M. 1991. *Stated preferences techniques: A guide to practice.* Hague Consulting Group, The Hague, the Netherlands.

Chapter 8   Consumer preferences for attributes of raw and powdered milk in Assam, Northeast India

Ma. Lucila A Lapar,[1] Manesh Choubey,[2] Partho Patwari,[3] Anjani Kumar,[4] Isabelle Baltenweck,[5] Mohammad A Jabbar[6] and Steven Staal[7]

1. l.lapar@cgiar.org; research scientist at the International Livestock Research Institute (ILRI), Hanoi, Vietnam.

2. choubey3@rediffmail.com; was an assistant professor at the Assam Institute of Management, Guwahati, Assam, India and is currently at the Centre for Microfinance Research, Chandragupt Institute of Management, Patna, India

3. pgallam@rediffmail.com; was a local project coordinator, ILRI, Assam, India and is currently a development consultant with the Centre for Microfinance and Livelihood, Assam, India

4. anjani@ncap.res.in; was a research scientist at ILRI, New Delhi, India and is currently a senior scientist at the National Centre for Agricultural Economics and Policy Research, New Delhi, India

5. i.baltenweck@cgiar.org; research scientist at ILRI, Nairobi, Kenya

6. mjabbar2@gmail.com; was a senior agricultural economist at ILRI, Addis Ababa, Ethiopia and is currently a consultant agricultural economist in Dhaka, Bangladesh

7. s.staal@cgiar.org; research scientist at ILRI, Nairobi, Kenya

Abstract

This paper discusses dairy consumption in Assam, specifically consumer preferences and trends in consumption, and their impact on determining dairy production and marketing opportunities. A survey was conducted of 1440 consumer households from urban and rural areas in 9 milk-producing districts in Assam state. The results of the survey confirmed previous observations that Assamese consumers prefer raw milk to processed liquid or powdered milk. This is largely dictated by the nature of consumption of milk in the state, namely, as a tea whitener or in form of milk sweets. Consumption levels are still way below the national average and this could be due to a number of reasons, of which taste preference is key. Cow milk constitutes over 90% of raw milk supply in Assam while the rest comes from buffaloes. It is perceived that there is potential for increasing the share of supply of buffalo milk. However, cow milk was generally preferred to buffalo milk with respect to specific quality attributes in both urban and rural areas. Consumers also generally preferred to source milk directly from producers or from outlets believed to provide a guarantee of milk quality and safety. A generic milk promotion campaign may be pursued in Assam to increase consumer awareness about the nutritional benefits of milk consumption. However, given

consumer concerns about quality and public health risks in informal markets and standard brands in formal markets, such a campaign should give attention to milk adulteration by some unscrupulous traders. Based on current levels of consumption, urban consumers were found to spend considerably more than their rural counterparts, particularly on high-value products such as traditional milk-based sweets and other processed dairy products. This apparent demand for high-value traditional processed dairy products offers good opportunities for value addition in small-scale dairy processing where appropriate quality and safety assurance can be ensured, as well as opportunities for rural employment.

Key words: consumer preference, milk, dairy, Assam, India

Background and objective

Milk consumption in Assam is mainly for tea whitening while a small segment of the population drinks boiled milk. Various traditional dairy products like *dahi* (curd), sweets and cream are also consumed, with demand for these products increasing tremendously during festivals. Between 1993 and 2000, monthly per capita consumption of milk and dairy products relative to total consumption expenditures was less than 10% in urban areas and about 5% in rural areas (National Household Survey, Government of India). During this period, per capita consumption of milk in urban areas increased by about 29% while that in rural areas decreased by about 8%. Consumption of dairy products such as condensed and powdered milk, ghee, butter and dairy-based baby food also increased significantly during this period in both urban and rural areas.

Conversely, milk production in Assam increased by only 4% during 1997–98 and 2005–2006 (Department of Animal Husbandry and Veterinary, Government of Assam). Per capita availability of milk from domestic production (about 2.4 litres of milk per month or 29 litres/year, as reported in the Government of Assam's Economic Survey of Assam 2000–2003), remains one of the lowest among the states in India. Actual consumption is slightly higher as additional quantities are imported from other states. Operation Flood, which propelled the successful 'White Revolution' in various states in India, somehow did not make a distinct impact on milk production in Assam, despite the fact that there were about 50 head of cattle and 4 head of buffalo per 100 persons in Assam, compared to the national average of about 46 head of cattle and 4 head of buffalo per 100 persons (Road map for agrarian prosperity in Assam).

The current thrust in dairy development in Assam aims to increase domestic production by addressing various identified technical constraints, including low reproductive efficiency of indigenous cows, a negligible proportion of crossbred (Jersey × local) dairy cattle to total cattle population, poor milk production of swamp buffaloes that are predominant in the state and lack of good quality grass/fodder (Sarkar 2004). Market and demand are likely to play major roles in the development of the sector but detailed information on the nature of demand and preferences of consumers for various product attributes is unavailable. Such information is needed for producers and market actors to take market-oriented production decisions to benefit from growing markets. In order to fill this knowledge gap, a survey was conducted to understand consumer preferences for milk and dairy products and trends in consumption, and their impact on determining dairy production and marketing opportunities.

Data source

A survey was conducted on a sample of 1440 households in 9 districts of Assam that were identified as key dairy-producing areas: Barpeta, Cachar, Jorhat, Kamrup, Morigaon, Nagaon, North Cachar Hills, Sonitpur and Tinsukia.[1] In each district, sample respondents were selected at random from identified urban and peri-urban centres (70% of respondents) and rural areas (30%). Urban centres generally comprised the cities or district towns while rural areas comprised mainly villages that were randomly selected on the basis of population size. The survey questionnaire was pre-tested before actual data collection. To maximize data accuracy, information was collected from the head of the family and/or the person responsible for acquiring food for the household.

Results and discussion

Frequency of consumption of dairy products

About 1% of sampled urban households and 6% of sampled rural households were involved in dairy production. Dairy producers were expected to have more direct knowledge about the characteristics of raw milk they produced and consumed while buyers in both rural and urban areas were expected to base judgements principally on the basis of experience and knowledge and, to some extent, on the basis of observation.

Almost all (97%) of the sampled household members identified themselves as non-vegetarians, implying that most were potential consumers of dairy products. However, over 98% of household members were reportedly lactose intolerant, an indication that most respondents were unable to drink liquid milk without experiencing gastric distress though they might have been able to consume fermented and other processed dairy products. With regard to actual food habits, 69% of the sampled urban consumers usually or occasionally drank fresh milk while 31% did not consume fresh milk at all. Of the sampled rural consumers, 87% usually or occasionally drank fresh milk while 13% did not drink fresh milk at all. Sixty-nine percent of urban households and 50% of rural households consumed powdered milk usually or occasionally. Other dairy products were consumed by a fairly small percentage of the sample households (Table 8.1). Products like flavoured, pasteurized, skimmed and ultra-heat treated (UHT) milk were rarely available in rural areas but available

---

1. An additional 60 institutional consumers were also surveyed: 28 hotels/restaurants, 20 hostels/guest houses, 4 hospitals, 3 education institutions, 2 army camps and 3 others.

in small quantities in urban areas. Given the importance of raw and powdered milk in the household dairy basket, the remainder of this paper is focused on these two products.[2]

Table 8.1. *Proportion of households consuming milk and dairy products*

Type of milk	Urban households (n = 1024)			Rural households (n = 440)		
	Never (%)	Usually (%)	Occasionally (%)	Never %)	Usually (%)	Occasionally (%)
Raw	31	62	7	13	67	20
Condensed	67	3	30	84	2	14
Flavoured	89	21	9	97	0	3
Ghol/matha/whey	96	<0.5	4	97	1	2
Lassi	84	2	14	96	0	4.
Packaged fresh	69	8	23	89	2	9
Packaged pasteurized	93	2	7	99	0	1
Powdered	31	35	34	50	14	35
Skimmed	99	<0.5	1	100	0	<0.5
UHT	100	0	0	100	0	0

Source: Consumer survey, Assam Dairy Development Project (2006).

Preference rating for different uses of raw and powdered milk

Raw and powdered milk are sometimes used as substitutes for each other but in reality, use-specific preferences for these two products indicate that in Assam they are not full substitutes across the various use options. Raw and powdered milk were rated on a scale of 0 (no preference) to 10 (highest preference), based on preference for different uses, namely, drinking, mixing with tea or coffee, baking or making sweets, and making yoghurt or *dahi*, and overall preference. Mixing with tea or coffee was the most common use of milk in Assam; in both rural and urban areas, raw and powdered milk were more or less similarly preferred for this purpose. For all other uses including overall preference, raw milk was rated higher than powdered milk (Table 8.2).

Preference rating for different attributes of raw and powdered milk

Raw and powdered milk were rated on a scale of 0 (no preference) to 10 (highest preference) based on specific attributes, namely, taste, nutritive value, health risk, hygiene, shelf life, availability, packaging and price, and overall preference. It was assumed that preferences with respect to these attributes would be based on consumers' prior use or knowledge of the products. Among both urban and rural consumers, the taste, nutritive value and price of raw milk were slightly more preferred to those of powdered milk. In the case of hygiene, shelf life and packaging, pow-

---

2. Among the sampled institutions, 42% occasionally or usually consumed raw fresh milk, 78% consumed powdered milk, 12–18% consumed pasteurized or packaged fresh milk while a few consumed other types of milk products. Overall preference for powdered milk was higher than for raw fresh milk. More detailed analysis of dairy consumption by institutional consumers is reported by Lapar et al. (2007).

dered milk was slightly more preferred while in terms of health risk, the differences were negligible (Table 8.3). Overall, raw milk was more preferred, especially in the urban areas.

Table 8.2. *Rating of raw and powdered milk by type of use*

Use of milk	Raw milk		Powdered milk	
	Urban	Rural	Urban	Rural
Drinking	7.3 (0.1)	6.8 (0.1)	1.1 (0.1)	0.6 (0.1)
Mixing with tea or coffee	7.0 (0.1)	7.0 (0.1)	6.8 (0.1)	5.9 (0.2)
Baking or making sweets	4.8 (0.1)	4.7 (0.2)	2.0 (0.1)	2.2 (0.2)
Making yoghurt/*dahi*	3.4 (0.1)	2.4 (0.2)	0.3 (0.1)	0.1 (0.1)
Overall preference	7.8 (0.1)	7.5 (0.1)	5.5 (0.1)	4.9 (0.1)

Standard deviations in parentheses. Preference rating on scale of 0 (no preference) to 10 (highest preference).
Source: Consumer survey, Assam Dairy Development Project (2006).

Table 8.3. *Rating of raw and powdered milk by location and selected attributes*

Product attributes	Raw milk		Powdered milk	
	Urban	Rural	Urban	Rural
Taste	4.8 (0.1)	4.6 (0.2)	3.9 (0.1)	3.3 (0.2)
Nutritive value	4.9 (0.1)	4.5 (0.2)	3.5 (0.1)	2.7 (0.1)
Health risk	3.8 (0.1)	3.5 (0.2)	4.1 (0.1)	3.5 (0.2)
Hygiene	3.5 (0.1)	3.1 (0.2)	4.5 (0.1)	3.7 (0.3)
Shelf life	3.0 (0.1)	2.7 (0.1)	5.4 (0.1)	4.3 (0.2)
Availability	4.8 (0.1)	4.7 (0.2)	6.0 (0.1)	4.2 (0.2)
Packaged	2.3 (0.1)	1.9 (0.1)	5.5 (0.2)	4.3 (0.2)
Price	4.4 (0.1)	4.1 (0.1)	4.0 (0.1)	3.1 (0.2)
Overall	5.3 (0.2)	5.0 (0.2)	4.6 (0.1)	3.6 (0.2)

Standard deviations in parentheses. Preference rating on scale of 0 (no preference) to 10 (highest preference).
Source: Consumer survey, Assam Dairy Development Project (2006).

Quality and safety rating of cow and buffalo milk

Cow milk constitutes over 90% of raw milk supply in Assam while the rest comes from buffaloes; there is potential for increasing the share of supply of buffalo milk. Respondents were asked to rate cow and buffalo milk in terms of quality and safety criteria related to their production and supply, namely, breed; type of animal feed; antibiotic treatment of the animal; and fat content, colour, consistency, smell/flavour and supply source of the milk. For each factor, possible indicator options were provided, e.g. for breed the choices were local and cross/improved.

Some of the criteria (such as colour, smell and consistency of milk) were physically observable while others were not immediately observable especially among urban respondents. In the latter case, preference ratings were based on expected knowledge about the criteria. For example, urban consumers could not ascertain whether a sample of milk

was from a local or crossbred cow so they were instead asked what their preference rating of the milk would be if they had prior knowledge that the milk was from a specified breed. Cow milk was generally preferred to buffalo milk with respect to all the criteria and related indicators in both urban and rural areas. Table 8.4 summarizes the results of consumer rating of preference for cow and buffalo milk with respect to the specific criteria mentioned above.

Table 8.4. *Consumer rating of quality and safety attributes of cow and buffalo milk*

Indicators	Cow milk		Buffalo milk	
	Urban	Rural	Urban	Rural
Breed				
Local	7.6 (0.1)	7.1 (0.2)	6.0 (0.2)	4.9 (0.3)
Crossbred/improved	5.0 (0.1)	4.8 (0.3)	4.3 (0.2)	3.5 (0.2)
Main type of feed used				
Grass	7.2 (0.1)	6.6 (0.2)	5.8 (0.2)	4.7 (0.3)
Straw	5.9 (0.1)	5.6 (0.2)	4.8 (0.2)	3.9 (0.2)
Concentrate	4.8 (0.1)	4.3 (0.1)	4.2 (0.2)	3.4 (0.2)
Antibiotic treatment				
Used	5.6 (0.2)	4.3 (0.2)	5.1 (0.2)	3.8 (0.3)
Not used	5.9 (0.2)	5.6 (0.2)	4.6 (0.3)	3.9 (0.3)
Fat content of milk				
High (full cream)	6.9 (0.1)	6.6 (0.2)	5.5 (0.3)	4.5 (0.3)
Medium (half-cream)	6.0 (0.1)	5.3 (0.2)	7.1 (2.3)	3.5 (0.2)
Low/none (skimmed milk)	3.4 (0.1)	2.6 (0.1)	2.7 (0.1)	1.7 (0.1)
Colour				
White	5.3 (0.1)	4.9 (0.2)	4.6 (0.2)	3.4 (0.2)
Yellowish	6.3 (0.1)	6.0 (0.2)	5.2 (0.2)	4.3 (0.3)
Consistency				
Thick	7.5 (0.1)	7.0 (0.2)	5.9 (0.2)	4.8 (0.3)
Watery	2.5 (0.1)	2.3 (0.1)	2.2 (0.1)	1.8 (0.2)
Smell/flavour				
Good/fresh	8.5 (0.9)	6.9 (0.2)	6.2 (0.2)	4.8 (0.3)
Bad/stale	1.3 (0.1)	1.2 (0.1)	0.7 (0.1)	0.5 (0.1)
Supply source/mode				
Producer's house/farm	7.2 (0.1)	6.8 (0.2)	5.7 (0.2)	4.8 (0.3)
Home delivery by producer	7.0 (0.1)	6.2 (0.2)	5.5 (0.2)	4.4 (0.3)
Home delivery by trader/vendor	5.0 (0.1)	4.0 (0.1)	4.0 (0.1)	3.0 (0.2)
Local market	4.0 (0.1)	3.6 (0.2)	7.9 (3.5)	2.6 (0.2)
Street vendor	3.4 (0.1)	2.9 (0.1)	2.6 (0.2)	2.0 (0.2)
Small/corner shop	4.6 (1.3)	2.9 (0.1)	2.4 (0.1)	1.7 (0.2)
Grocery shop/supermarket	3.5 (0.1)	6.1 (3.2)	2.6 (0.2)	2.2 0.4)
Dairy/sweet shop	4.2 (0.1)	3.5 (0.2)	3.1 (0.1)	2.3 (0.2)
Restaurant	2.9 (0.1)	2.7 (0.2)	2.3 (0.1)	1.7 (0.2)
Milk co-operatives	5.1 (0.1)	4.3 (0.2)	3.8 (0.2)	2.4 (0.2)

Standard deviations in parentheses. Preference rating on scale of 0 (no preference) to 10 (highest preference).
Source: Consumer survey, Assam Dairy Development Project (2006).

Differences in preference ratings for milk from animals treated and not treated with antibiotics were not significant except in the case of cow milk in rural areas where milk from animals not treated with antibiotics was more preferred. This may have been because the presence of antibiotic residues in fresh milk could not be readily verified or observed and this information was unlikely to be divulged by milk suppliers. On the other hand, rural producers who may have treated their animals with antibiotics might have known about the possible consequences of antibiotic residues hence their preference for milk from animals not treated with antibiotics. For cow and buffalo milk, rural and urban consumers preferred yellowish and thick milk to that with a white colour and watery consistency. Consumers generally equated the yellowish colour and thick consistency with whole milk which was more preferred than milk with a white colour and watery consistency which was associated with skimmed or adulterated milk of lower quality.

Milk sourced from the farm gate was more preferred than milk from other sources. Consumers appeared to have a higher preference for sources of milk that allowed for direct observation or verification of milk quality and those based on long-term relationships and trust that offer quality assurances and guarantees of some kind. These relative preferences of outlets were more clearly reflected in the choice of outlets in most recent purchases of raw and powdered milk (Table 8.5). Trust in the seller was the most commonly cited reason for choice of outlet for raw milk in both urban and rural areas. Closeness to the consumer's home was the most commonly cited reason for choice of outlet for powdered milk in urban areas, while closeness to consumer's home and lack of alternative suppliers were cited most commonly by rural consumers (Table 8.6).

Table 8.5. *Proportion of consumers citing choice of outlets for the most recent purchases of milk*

Source of most recent milk purchase	Urban consumers (%)	Rural consumers (%)
Producers	49	60
Milk traders/vendors	46	39
Supermarkets/grocery shops	86	87
Other outlets	5	1

Table 8.6. *Proportion of respondents citing reasons for choice of outlets for the most recent purchases of raw and powdered milk*

Reasons for choice of outlet	Urban consumers (%)		Rural consumers (%)	
	Raw milk	Powdered milk	Raw milk	Powdered milk
Trust in seller	74	36	77	30
Near home	8	60	10	44
No alternative supplier	14	1	9	25
Others	4	3	4	1
Total	100	100	100	100

Source: Consumer survey, Assam Dairy Development Project (2006).

Quality rating for attributes of powdered milk

Quality of powdered milk may be determined on the basis of criteria such as brand, fat content, smell/flavour, sugar content and enrichment with vitamins and/or minerals. Several brands of powdered milk are available in the Assam market but their actual market shares are not known. Results showed that *Amul* and *Everyday* were the most preferred brands in both rural and urban areas (Table 8.7). Seventy-four percent of sampled consumers in urban areas and 71% in rural areas said they depended on brand name to ascertain the quality of powdered milk, while 10–15% depended on visual inspection and 10–13% depended on taste; assessment of these three criteria of quality is perhaps based on experience.

Table 8.7. *Rating of powdered and condensed milk according to various quality and safety criteria*

Quality and safety criteria	Urban consumers	Rural consumers
Brand		
Amul	5.3 (0.1)	4.2 (0.2)
Everyday	5.0 (0.2)	3.6 (0.2)
Mother Dairy	1.6 (0.2)	0.5 (0.1)
Purabi	1.1 (0.1)	0.1 (0.1)
Anik	1.7 (0.1)	0.8 (0.2)
Wamul	2.3 (0.1)	1.6 (0.2)
None (unbranded)	1.2 (0.1)	0.8 (0.1)
Fat content		
High (full-cream)	4.8 (0.1)	3.8 (0.2)
Medium (half-cream)	4.6 (0.1)	3.5 (0.2)
Low/none (skimmed milk)	3.1 (0.1)	2.3 (0.1)
Smell/flavour		
Good/fresh	6.2 (0.2)	4.9 (0.3)
Bad/stale	0.8 (0.1)	0.5 (0.1)
Colour		
White	4.8 (0.1)	4.2 (0.4)
Yellowish/creamy	4.4 (0.1)	3.5 (0.2)
Sugar content/sweetness		
High	4.3 (0.1)	3.5 (0.2)
Medium	5.1 (0.1)	3.8 (0.2)
Low	3.2 (0.1)	2.4 (0.1)
Vitamin/mineral enriched		
Yes	5.5 (0.2)	4.2 (0.2)
No	2.1 (0.1)	1.6 (0.1)

Standard deviations in parentheses. Preference rating on scale of 0 (no preference) to 10 (highest preference).
Source: Consumer survey, Assam Dairy Development Project (2006).

In urban areas, 8% of respondents said that the quality of their recent purchases of powdered milk was 'very good', 73% said it was 'good', 17% said it was 'satisfactory' and 2% said it was 'poor'. On the other hand, in the rural areas, 11% of respondents said that the quality of

their recent purchases of powdered milk was 'very good', 67% said it was 'good', 21% said it was 'satisfactory' and 1% said it was 'poor'.

Perception of health risk and measures to maintain quality of raw milk

Most urban and rural consumers were aware of the health and nutritional benefits of consuming milk. Consumers used a variety of ways to ascertain the freshness of purchased raw milk and took various subsequent steps to maintain the quality and safety of the milk (Table 8.8). With regard to the methods used to ascertain the quality of the most recent purchase of raw milk, 84–86% of respondents used visual inspection, 7–8% depended on the seller's guarantee, 6–7% used taste and 1–2% said it was not possible to ascertain the quality or freshness of raw milk.

Table 8.8. *Measures used by consumers to ascertain and maintain the quality of raw milk*

	Urban consumers (%)	Rural consumers (%)
Ascertain freshness of purchased milk		
Trust seller/supplier	31	31
Examine by sight/smell	27	26
Boil	34	31
Not purchased/do not know	8	12
Container used for purchase		
Metallic container	58	57
Plastic bottle	17	21
Polythene bag/glass bottle/other	7	5
Do not purchase or consume	19	16
Container used for storage		
Metallic container	84	89
Others	1	1
Not applicable	15	10
Refrigerate milk		
No	63	85
Yes	19	7
Sometimes	11	2
Not applicable	7	6
Perceived risks associated with consumption of unboiled milk		
Bad for health	34	27
Cause diseases	24	23
Germs/bacteria	29	35
Others	13	15
Boil milk before consumption		
Yes	88	88
No	12	12

Source: Consumer survey, Assam Dairy Development Project (2006).

Only 19% of urban respondents and 7% of rural respondents reported refrigerating fresh milk on a regular basis. The relatively lower use of refrigeration in rural areas may be due to limited ability to purchase refrigerators and lack of electricity. However, nearly all respondents recognized the potential health risks associated with drinking raw milk as evidenced by the high proportion (88%) of respondents in urban and rural areas who said that they boiled milk before consuming it.

In urban areas, 9% of respondents said that the quality of their recent purchases of raw milk was 'very good', 58% said it was 'good', 26% said it was 'satisfactory' and 7% said it was 'poor'. On the other hand, in the rural areas, 10% of respondents said that the quality of their recent purchases of powdered milk was 'very good', 68% said it was 'good', 17% said it was 'satisfactory' and 5% said it was 'poor'. However, 65% of urban respondents and 32% of rural respondents expressed willingness to pay a higher price if the quality and hygiene of raw milk could be guaranteed (Figure 8.1).
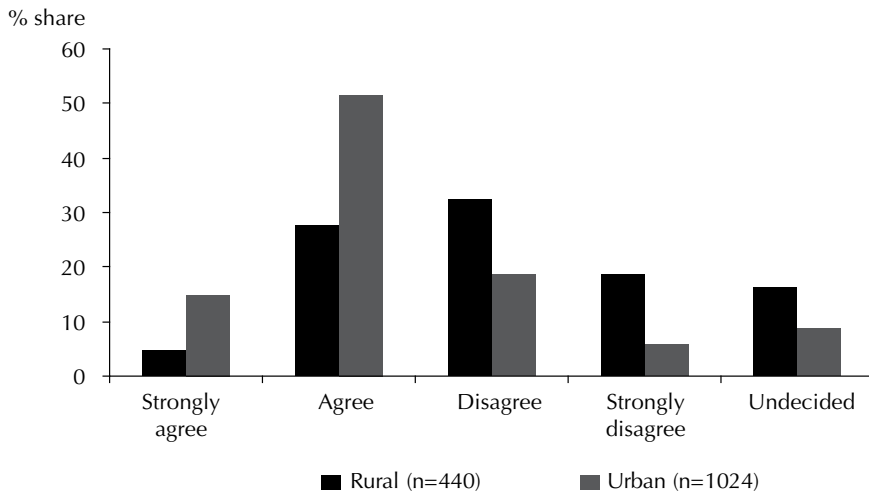
Source: Consumer survey, Assam Dairy Development Project (2006).
Figure 8.1. *Proportion of consumers responding.*

Summary and implications

The findings of the survey confirmed previous observations that Assamese consumers prefer raw milk to processed liquid milk or powdered milk. This is largely dictated by the nature of consumption of milk in the state, namely, as a tea whitener or in form of milk sweets. Consumption levels are still way below the national average and this could be due to a number of reasons, of which taste preference is key. However, taste preference can be modified if not completely changed, as previous studies have shown (Waldfogel 1999). In recent years, Assam has witnessed an influx of immigrants whose cultures have had a strong

influence on the local people, prompting them—especially the younger generation—to incorporate new food products like cheese and butter into their diets. There have also been increased government efforts to promote the consumption of dairy products. Therefore, the tastes of the Assamese population are likely to change with evolving socio-economic circumstances and increasing urbanization; a likely long-term result of this is increased consumer acceptability of a wider variety of dairy products. In addition, the introduction of a school milk program is likely to boost the demand for liquid milk.

A generic milk promotion campaign may be pursued in Assam to increase consumer awareness of the nutritional benefits of milk consumption. While promotion campaigns have been shown to have minimal impact on demand (Kinnucan and Miao 2000; Davis 2005), they generate considerable benefits to producers and traders through increased profits. This is because demand for milk is generally price elastic, so that even a minimal change in demand (due to the promotion campaign) will result in much higher returns from increased sales.

The generic milk promotion campaign should also take into account consumer awareness and preference for various products and product attributes such as source, market outlet, product quality and safety. Given consumer concerns about quality and public health risks in informal markets and standard brands in formal markets, the milk promotion campaign should give attention to the practice of milk adulteration by some unscrupulous traders and educate consumers and traders on the risks associated with drinking adulterated milk. Stricter vigilance and enforcement of already existing regulations should be implemented. This initiative could be further boosted by empirical evidence from milk testing that ILRI and its local partners have implemented as a complementary activity to the structured consumer survey.

Consumers generally prefer to source milk directly from producers or from outlets that they trust to guarantee the quality and safety of the milk they buy. While this aspect of supply can be easily addressed in rural areas where consumers have easy access to milk at the farm gate, the issue may need to be seriously considered in the context of milk marketing channels in urban areas. Currently, urban consumers mostly buy milk from itinerant vendors and sometimes, depending on ease of access, directly from producers. However, many discriminating consumers, who are also willing to pay the relatively higher price of pasteurized milk, buy their milk from grocery shops and supermarkets. For resource-constrained consumers who do not have easy access to direct sources of milk, there is a need to find a way to improve the level of trust and satisfaction with the quality and safety of milk sold by these informal itinerant milk vendors. Indeed, consumers in Assam will be stimulated to increase demand for milk when they perceive that they are getting value for money, i.e. the quality of milk commensurate to the price they pay for it. One option for jumpstarting the

increase in demand for milk is a recognized, effective certification scheme that will provide an assurance of the quality of milk sold by the various actors along the producer-to-consumer supply chain.

Based on current levels of consumption, urban consumers spend considerably more than their rural counterparts, particularly on high-value products such as traditional milk-based sweets and other processed dairy products. This apparent demand for high-value traditional processed dairy products offers good opportunities for value addition in small-scale dairy processing where appropriate quality and safety assurance can be ensured, as well as opportunities for rural employment.

References

Davis G. 2005. The significance and insignificance of demand analysis in evaluating promotion programs. *American Journal of Agricultural Economics* 87:673–688.

Government of Assam. Various years. *Milk production in Assam.* Department of Animal Husbandry and Veterinary, Government of Assam.

Government of Assam. *Economic survey of Assam 2000–2003: Livestock and dairy development.* http://www.assamgov.org/ecosurvey/Dairy.htm/

Government of India. Various years. *National Household Survey*. Government of India.

Kinnucan H and Miao Y. 2000. Distributional impacts of generic advertising on selected commodity markets. *American Journal of Agricultural Economics* 82:672–678.

Lapar ML, Choubey M, Patwari P, Kumar A, Baltenweck I, Jabbar M and Staal S. 2007. *Comprehensive study of the Assam dairy sector: Milk and milk products.* ILRI (International Livestock Research Institute), Nairobi, Kenya. 170 pp.

Road map for agrarian prosperity in Assam. http://assamagribusiness.nic.in/agrarianprosperity/DairyPoultrypiggery.pdf

Sarkar AB. 2004. Five strategies for development of animal husbandry in Assam. Assam Agricultural University, Guwahati, Assam, India. Mimeo.

Waldfogel J. 1999. *Preference externalities: An empirical study of who benefits whom in differentiated product markets.* NBER Working Paper No. 7391. NBER (National Bureau of Economic Research), Cambridge, USA. 53 pp.

Chapter 9   Innovative and participatory risk-based approaches to assess milk safety in developing countries: A case study in Northeast India

Delia Grace,[1] Derek Baker[2] and Thomas F Randolph[3]

1. d.grace@cgiar.org; research scientist at the International Livestock Research Institute (ILRI), Nairobi, Kenya
2. d.baker@cgiar.org; research scientist at ILRI, Nairobi, Kenya
3. t.randolph@cgiar.org; research scientist at ILRI, Nairobi, Kenya

Abstract

Food safety is a major problem and of increasing concern in developing countries. Risk-based approaches are current best practice but have been little applied in poor countries. We present a case study from Assam, Northeast India, illustrating three key elements of risk-based approaches in the context of the informal dairy sector. We used risk-based targeting to categorize milk vendors into a risk hierarchy, thus allowing vendors who pose most risk to human health to be identified, and inspection and intervention directed accordingly. We also describe pathway analysis, in which the food product is traced from production on farm to consumption. This helps identify critical control points where action can, and must, be taken to avoid risk to human health. In Assam, the last step of the pathway (house-to-house vendor to consumer) was where risk increased most for raw milk, while for milk sweets the holding time of the prepared sweet was critical. Participatory risk analysis posits that building on indigenous knowledge will be more effective than top–down solutions and we looked at indigenous risk management, that is, the existing practices that reduce risk. We found a range of good practices among all actors. Consumers had the highest level of good practice. We also examined the relation between good practice and low bacterial counts in milk and were able to identify the practice most associated with safe production. This case study shows that risk-based approaches can be usefully applied in informal markets in developing countries.

Keywords: participatory risk assessment, milk-borne disease, informal sector, milk markets, India

Introduction

Food is a major source of hazards to human health and food-borne disease is globally the single most common illness. In India, it is estimated that 20% of deaths among children under five are caused by diarrhoeal disease (WHO 2006), 70% of these being associated with unsafe food or water (Unnevehr and Hirschhorn 2000). In most developing countries, food safety systems are dysfunctional and, despite increasing concern from government and consumers, India is no exception. A recent internet discussion pointed out that regulation is not working, adulteration is widespread, testing is inadequate, corruption is rampant, rules are not effective or followed and there are major hygiene and safety problems in all areas of food production and retailing (Solutions Exchange 2008).

Risk-based approaches offer new ways of managing food safety in developing countries. Not only are they more effective at decreasing risks, but they can also be a bridge between food safety and livelihood concerns. The first component of risk analysis—risk assessment—generates an estimate of negative health impacts of a hazard as well as the likelihood of their occurrence. This information can then be compared with economic data on the costs and benefits of smallholder production and marketing (including externalities such as income opportunities for poor women or environmental degradation from abattoirs), and the costs and benefits of risk mitigation. This allows decision-makers to set appropriate levels of protection based on evidence rather than anecdote and subjective preference. Moreover, the focus on a 'farm-to-fork' pathway approach allows the identification of risk mitigation points along the food value chain. This can help identify interventions that maintain market access for smallholders. However, although risk-based approaches have been formally adopted by most developing-country governments, there have been few applications to the problem of food safety in the informal markets where most of the world's poor buy and sell.

Studies by the International Livestock Research Institute (ILRI) and partners suggest this is partly due to lack of expertise in the relatively new field of risk analysis and partly due to difficulties in applying risk-based methods to diverse, non-linear, shifting and data-scarce systems in which formal and informal (or traditional) food supply systems co-exist and overlap. Views of various stakeholders on food safety objectives diverge; there is low willingness or ability to pay among consumers for improved food quality, and low enforcement capacity (Cole et al. 2008). Based on previous analysis and research, we believe that incorporating participatory methodologies can meet this need for contextualization of risk analysis (Grace et al. 2008a). Since their introduction in the 1970s, participatory methods and techniques have become central to community development. They are promoted on the basis that they are more effective, more sustainable and less costly, and more ethical in their inclusion of the poor in the planning and decisions that affect them.

Applied to risk assessment, participation involves both the use of participatory methods and a people-based, bottom–up and empowering approach to development.

This case study shows the application of risk-based approaches, including participatory risk assessment, to the informal dairy sector in Assam and the strengths and weaknesses of this methodology. The study focused on the hazard caused by bacterial pathogens (animal and human) to the health of milk and milk-sweet consumers in Assam. Three components of risk-based approaches are featured:

1. Risk-based targeting: Conventional food-safety assurance applies inspections and interventions uniformly across all elements of a population. Risk-based inspection concentrates scarce resources on the most problematic areas by allocating them according to the performance of each food processing or retailing facility.

2. Pathway analysis: Conventional epidemiological studies look at the presence of hazards at random points (e.g. end of production, point of sale, point of consumption etc.) The 'stable-to-table' or 'farm-to-fork' perspective systematically considers the movement of hazards from point of origin to consumption. This allows assessing the change in pathogen loads along the chain and hence a better estimation of risks to consumers. It also helps identify the points where risk can be best reduced.

3. Indigenous risk mitigation strategies: Conventional food-safety promotion concentrates on what is being done wrong and on rules and punishments to correct this. Development theory suggests that basing food safety on participation, local needs and knowledge will be more effective than control and command.

Materials and methods
Risk-based targeting

A cross-sectional survey of milk outlets was carried out in 2006 in Guwahati and Jorhat, the two major cities of Assam which is one of the seven states of Northeast India. In each city, a list of all the administrative areas (wards) was obtained (60 in Guwahati and 19 in Jorhat) and in each city 6 wards were randomly selected from this list. Enumerators then visited the wards and constructed a census of all points of milk-sale and households. Stratified random sampling was carried out in each ward in shops selling pasteurized milk (12), shops selling unpasteurized milk (12), distribution points (6) and households purchasing milk from house-to-house vendors (12). Where the number of elements in the strata was less than the quota for the strata, then all elements for the strata were selected. Milk was aseptically collected into sterile containers which were put on ice and analysed within four hours.

Physical quality of milk was assessed using an ultrasonic analyser (Akashanga®) which measured added water, fat and solids-not-fat (SNF). Milk safety was assessed by total plate counts and coliform counts on dehydrated media (Petrifilm 3M®). Total plate counts are a non-specific measure of poor milk handling while the presence of coliform bacteria indicates milk has been contaminated by human or animal faeces.

The importance of different factors on milk safety was assessed through two linear regression models in which the dependent variables were log of total bacteria counts and log of coliform counts, respectively, and the independent variables included city, point of sale and processing method. All statistical calculations were carried out using Stata®. Independent variables which had a significant effect on bacterial load were retained to group sellers and products into different risk categories.

Pathway analysis

For the milk pathway analysis, we identified 12 'farm-to-fork' pathways that aimed to cover the range of pathways found in Guwahati (e.g. a maximum variation sample). A questionnaire used at farm level asked the name and address of everyone who bought milk. We then traced these and administered a questionnaire where respondents listed all the sources and buyers of milk. The process continued until the point of consumption. The safety and physical quality of milk were assessed as described above.

In addition, 10 sweetshops were randomly selected from one ward in each city. A partial pathway was constructed for *kalakan*, a dairy-based sweet, starting with raw ingredients entering the shop and ending with the ready-to-eat sweets on display. Raw milk was aseptically sampled, as were sweets at the start of display, halfway through the display period and at the end of the display period (e.g. the last sweet to be sold). These were assessed for total bacteria, coliforms and presence of *Listeria monocytogenes*, an emerging and important pathogen often associated with dairy products, using the dehydrated media mentioned earlier. Bacterial counts were compared to national standards and statistical comparisons between groups made by the Chi-square test.

Indigenous risk mitigation

An objectively scored checklist of hygiene practices was administered at each step of the 12 milk pathways and the 10 sweet shops. Separate checklists were developed for farmers, vendors and milk-sweet consumers. A score was then given to each good practice observed and these were summed to give an overall 'good practice score' which was then normalized to a scale from 0 to 100. Different groups were compared using the Mann-Whitney statistic.

Results and discussion

Risk-based targeting

We assessed how safety and quality of milk varied according to city of sale, point of sale and processing method. In total, 345 samples were taken: 202 in Guwahati and 143 in Jorhat. Points of sale were shops, distribution points and house-to-house vendors. Distribution points consisted of sites on the pavement where vendors set up in the morning and evening and sold milk from metal churns. Milk was categorized according to processing method as ultra-heat treated (UHT), pasteurized and raw. The linear regression model showed a significant association between processing and point of sale on the one hand and bacterial counts on the other, but not between city of sale and bacterial counts. By categorizing according to point of sale and type of processing, we were able to develop a hierarchy of risk, shown in Table 9.1. Milk sold from shops and UHT milk was associated with lower levels of bacterial hazards, and raw milk and milk sold by house-to-house vendors with higher levels.

Table 9.1. *Bacterial quality of milk samples in Assam according to processing method and point of sale*

Processing	Point of sale	Total bacteria (log/ml)	Total coliforms (log/ml)	n
UHT	Shop	3.1	0.0	120
UHT	Distribution point	4.7	0.0	3
Pasteurized	Shop	5.5	2.1	34
Raw	Distribution point	5.8	3.5	33
Raw	House-to-house vendor	6.1	3.7	144
Pasteurized	Distribution point	6.9	5.4	4

We conclude that it is possible to categorize milk actors into different groups with respect to the risk their products are likely to pose to consumer health, and that these categories are broadly consistent with our understanding of risk, in that more risk is associated with longer chains, the informal sector and raw, unprocessed milk. Further studies would be needed to see if these trends are stable over time, and if this proves to be the case such a ranking would help identify those subgroups which pose most risk. It is interesting to note that currently most government attention is paid to the subgroups which appear to present least risk. The study also gives insights which might not otherwise be available. For example, pasteurized milk is usually considered a safe product by virtue of its processing. While this was true for most pasteurized milk in the study, the few samples sold through a route which is atypical for pasteurized milk (kerb-side vending points) were actually the least safe of all milk sampled.

We also compared the bacterial quality of milk at point of sale originating from different dairies. Milk from dairies within the state of Assam (local dairies = 30) contained higher levels of total bacteria and coliforms than milk from dairies outside the state (n = 134);

other differences were not statistically significant (Table 9.2). However, UHT milk, which inherently has higher bacterial quality, was produced only by dairies outside the state, and when we compared pasteurized milk from local dairies with pasteurized milk from the one dairy outside Assam we found the latter had substantially worse bacteriological quality. This is logical given the greater distance over which it is transported. However, the sample size was not large enough to show if differences between dairies producing pasteurized milk were significant, and as with the previous analysis, samples need to be repeated over time to establish trends.

Table 9.2. *Bacterial quality of milk samples in Assam according to dairy of origin*

Dairy	Fat (%)*	Solids-not-fat (%)*	Added water (%)*	Total bacteria (log/ml)^	Coliforms (log/ml)^	Origin 1 = local	Processing	n
Taaza	3.6	7.9	6.0	3.0	0.0	0	UHT	120
Prithbi	1.9	7.3	6.8	4.3	0.0	1	Pasteurized	4
Mother	3.2	7.0	17.0	4.7	0.0	0	UHT	3
Central	1.6	6.8	20.0	5.2	2.2	1	Pasteurized	5
Purabi	3.1	8.1	3.0	5.3	1.9	1	Pasteurized	13
Dairy Fresh	2.6	7.1	16.0	5.7	1.5	1	Pasteurized	5
Seema	4.3	8.1	4.0	5.9	5.6	1	Raw, chilled	1
Komul	3.2	8.0	4.0	6.9	4.5	0	Pasteurized	11
Suruchi	4.4	8.2	2.0	7.1	6.2	1	Raw, chilled	2

* Median ^Mean.

Adulteration with water was present in milk from all dairies. Among local dairies, there was considerable variation in adulteration with water (from 2 to 20%). In all samples, total bacteria counts were correlated with coliform counts.

Pathway analysis

Most raw milk pathways were relatively short with only one to four intermediaries between farm and consumer. For nine of the pathways mapped, all milk was channelled to the informal sector, either being sold directly to households (one chain) or passing through one to three transporters and bulkers before being sold to vendors who sold from house to house. For one pathway, all the milk went to the dairy co-operative and for another pathway, just over half the milk. One pathway was the *gosala* (several hundred cows are housed together and the milk sold directly to consumers without intermediary). In all cases, farmers consumed some of the milk produced within the household. There was a high level of diversity; farmers marketed their own or other farmers' milk to traders, vendors and co-operatives, sold milk directly to households or indirectly via hired intermediaries, and all farmers consume within their own households. Similarly, traders sold to other traders, hotels,

sweetshops, kiosks or households in addition to consuming within their own household. Figure 9.1 illustrates an example of a pathway showing changes in milk quality between cow and consumer.
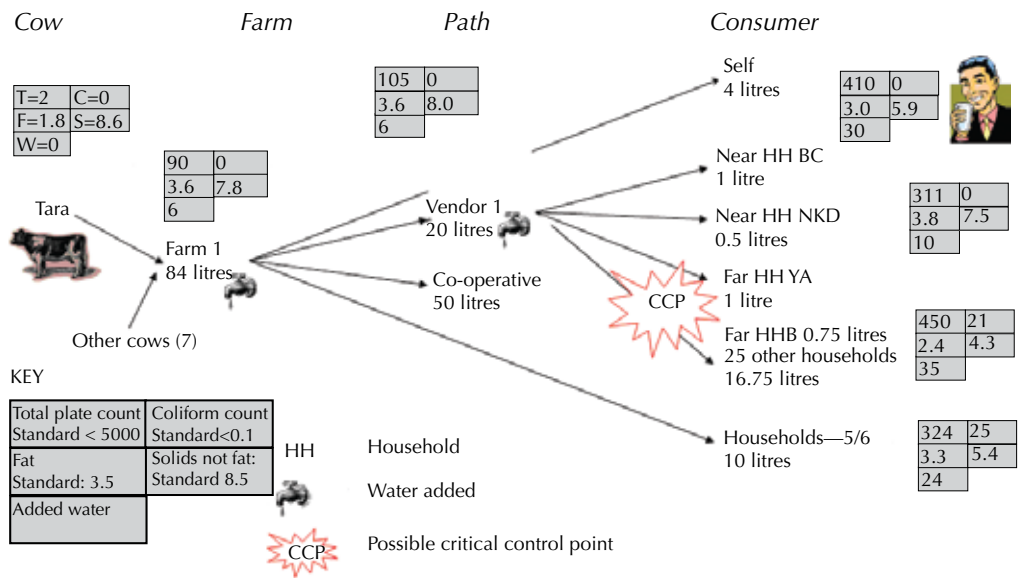
Figure 9.1. *Example of a pathway showing changes in milk quality between cow and consumer.*

Bacterial quality declined consistently along the milk pathway and the level of adulteration with water increased. However, at the point of consumption, all raw milk had an acceptable total plate count according to national standards. On the other hand, most raw milk samples were adulterated with water and only half had acceptable coliform counts. In the case of coliform counts, the main risk amplification step (i.e. where quality deteriorated most) was between the last vendor and the consumer. Likewise, the main point of water adulteration was the step immediately preceding the consumer. Nearly half (46%) of farmers and intermediaries reported adding water to milk, and the only two path structures without water adulteration were the *gosala* and the milk co-operative models.

This case study shows how mapping risk pathways can reveal the complexity of milk value chains and the variety of actors involved. Identifying steps where there is a sudden, large quality decline will enable better targeting of interventions. On the other hand, identifying the minority of actors who maintain quality in circumstances where quality declines for other actors may help identify transferrable innovations. In this case, the incentives resulting in the absence of adulteration to co-operative and *gosala* milk may be worth further investigation.

The process of sweet-making was analysed in 10 shops, 5 each in Guwahati and Jorhat. A flow chart was constructed of the movement of milk from entry into the shop to finished

product. Eleven different processes were identified and the time taken for each, quantities of materials involved, and temperature for each noted. The average production time was 112 minutes which included boiling for 41 minutes. One-third of sweet samples met national standards for bacteria and coliform counts, half—though substandard—were close to standard, while the remaining 13% were well below standards. *Listeria monocytogenes* was not found in any samples. Samples from Jorhat were of significantly higher quality than those from Guwahati (67% meeting standards vs. 0%; p = 0.000 Chi^2). In all shops, bacteria counts were high in raw milk, low in fresh and stored sweets and high in the longest-kept sweets (Figure 9.2), indicating that a critical control point for milk sweets is the length of time for which prepared sweets are stored.

No. of organisms per ml or per gram
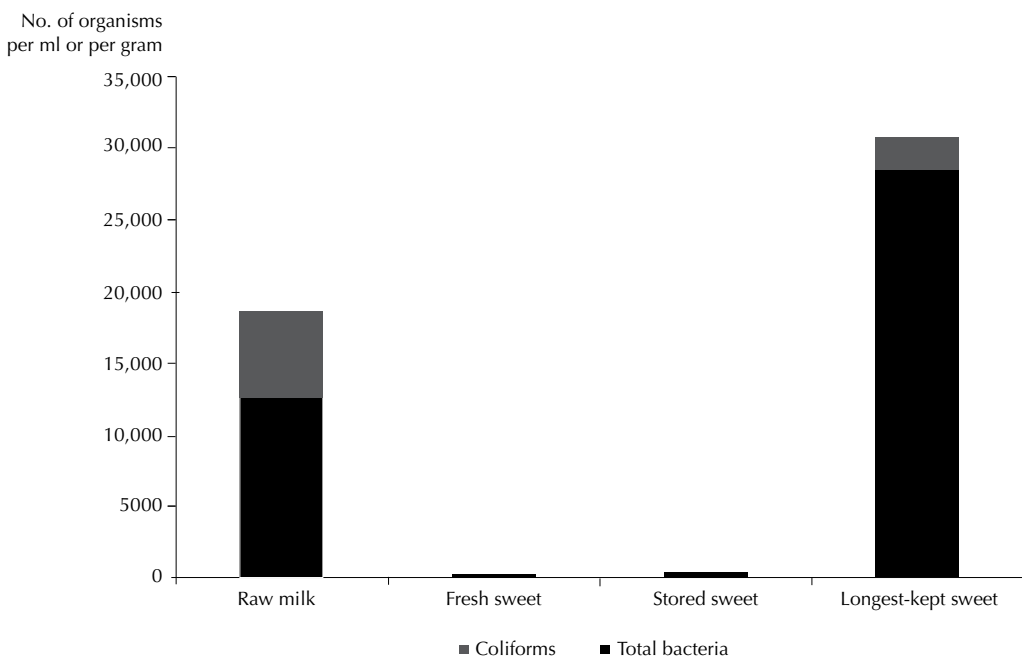
Figure 9.2. *Change in bacteria counts of milk sweets during processing and storage.*

Indigenous risk mitigation

The survey found numerous good practices used by actors at each step in the milk value chain. Some practices were used by the majority of actors (e.g. wash hands before milking; discard milk unfit for human consumption). Other good practices were used only by a minority, (e.g. wash hands between milking; sieve milk to remove gross contamination). Table 9.3 gives examples of good milk hygiene practices observed by different actors.

Table 9.3. *Good milk hygiene practices observed by different actors*

Farmers (%)		Traders and hawkers (%)	
Wash hands before and after milking each cow	92	Use aluminium containers	100
Discard milk unfit for consumption	75	Wash milk containers with soap	100
Concrete floor or slats	50	Milk holding < 4 hours	85
Milk outside cow shed	42	Have adequate cover for containers	69
Have clean floors	42	Wash water from hygienic source	69
Keep clean during milking	42		
No foul smells or airborne dirt	25	Consumers (%)	
Wear suitable clean clothes	17	Clean milk utensils with soap	100
Dry hands before and after milking each cow	8	Boil milk before consumption	95
Separate milk unfit for consumption	8	Keep milk in fridge	44
Sieve milk to remove dirt	8	Store milk in clean place	35

Conventional hygiene assessment tends to focus on what is being done wrong rather than what is being done well, and participatory learning and action theory shows that the former approach is less effective than taking the starting point of people's knowledge and competencies and building on this. Indigenous practices and technologies can often be quite effective at decreasing risk (Grace et al. 2008b) and have the added advantage of being 'pre-adapted' for the context in which they are used.

When different groups of actors are compared it can be seen (Figure 9.3) that consumers had the highest observance of good hygienic practices and farmers the lowest. However, this reflects a greater number of practices identified for other actors and more homogeneity of practice within the consumer group. Interestingly, nearly all consumers boiled milk before consumption. This will eliminate risk due to harmful bacteria, which cause many serious milk-borne diseases including brucellosis and tuberculosis.
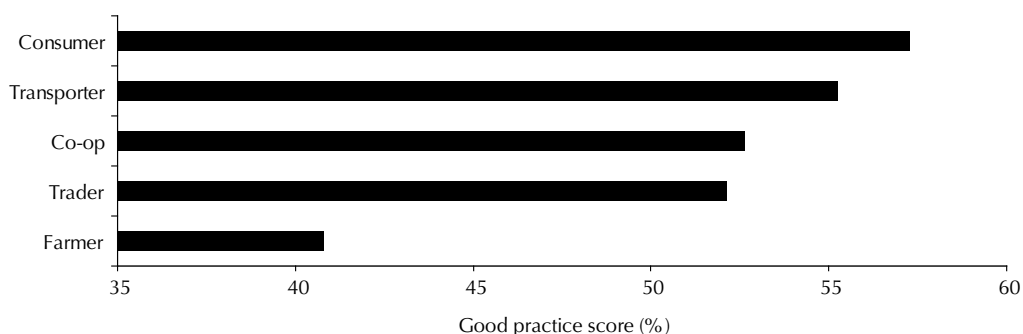
Figure 9.3. *Average good hygienic practice score of milk value chain actors handling milk.*

Sweetshops also varied considerably in the number of good practices followed. A total of 73 good practices were observed, grouped under personal hygiene, food preparation, cold holding, food storage, cleaning and sanitizing, utensils and equipment, garbage management, pest control and hygiene of sweet-selling area.

Shops which produced sweets of good or moderate quality had a median score of 42% while those producing sweets of poor quality scored 20%; the difference was highly significant, despite the small sample size (10 shops), indicating a powerful influence of hygienic practice on safety of milk sweets ($p = 0.04$).

Shops with good food safety outcomes showed greatest difference from those with poor food safety outcomes in the areas of selling area hygiene, ingredient storage, cold storage and cleaning regime, suggesting that efforts to improve sweet-safety should focus on these control points (Figure 9.4).
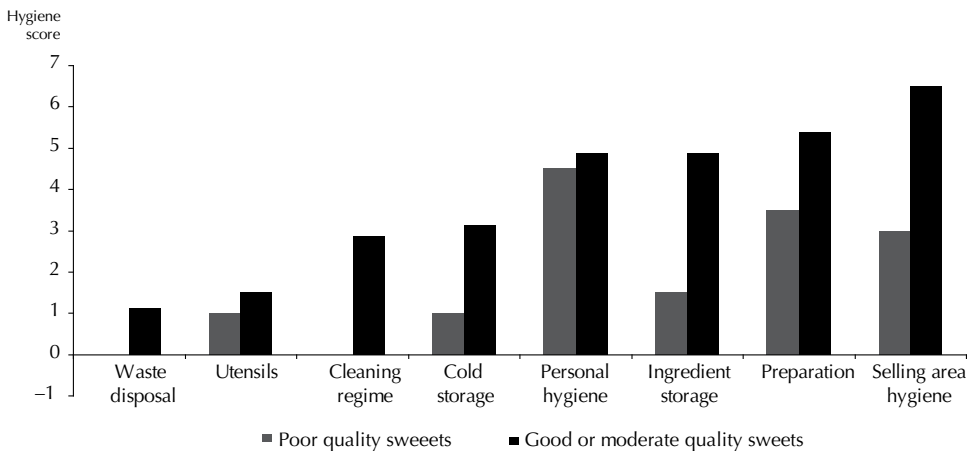
Figure 9.4. *Differences in hygiene practices between shops producing safe and unsafe sweets.*

Conclusions

This case study showed how some of the key principles of risk-based approaches to food safety can be applied when assessing informal milk markets in developing countries. Cross-sectional surveys showed that points of sales for milk could be divided into a hierarchy of risk, allowing for targeting of resources to high-risk areas. Pathway analysis identified critical control points where action is needed to ensure raw milk and milk sweets are safe to consumers. Assessing practices revealed several risk-mitigating practices, one of the most important being that nearly all milk (95%) is boiled before consumption. We were also able to identify those practices which had most impact on food-safety outcomes, allowing the development of risk-based extension messages.

Informal markets in developing countries are characterized by non-linear, unregulated, heterogeneous and self-organizing food value chains. In this difficult context, conventional food safety based on command and control regulation has failed and risk-based approaches are considered to have greater potential. The challenges we encountered of applying risk-based approaches included the lack of pre-existing information; great diversity of structures and practices; difficulties of working with informal-sector participants due to poor relations with officials; and problems of carrying out laboratory analyses given extreme environmental conditions and lack of equipment and skilled staff. We responded to these challenges by extensive use of qualitative analyses to capture uncertainty, diversity and complexity; incorporation of participatory learning and action methods to engage study respondents and generate ownership; and adoption of rapid and robust laboratory tests for quality assessment. The results generated, though with wide margins of error and limitations to generalizability, represented a major improvement on the existing situation, where stakeholders had essentially no information on the hazards present in informally marketed milk. This case study supports the hypothesis that risk-based approaches are the best way of addressing food safety problems in informal markets. However, these approaches will need continued adaptation, testing and dissemination.

References

Cole D, Grace D and Diamond M. 2008. Researcher approaches to evidence on urban agriculture and human health. In: Cole D, Lee-Smith D and Nasinyama G (eds), *Healthy city harvests: Generating evidence to guide policy on urban agriculture*. CIP (International Potato Centre) and Makerere University Press, Uganda.

Grace D, Nasinyama G, Randolph TF, Mwiine F and Kang'ethe E. 2008a. City dairying in Kampala: Integrating benefits and harms. In: Cole D, Lee-Smith D and Nasinyama G. (eds), *Healthy city harvests: Generating evidence to guide policy on urban agriculture*. CIP (International Potato Centre) and Makerere University Press, Uganda.

Grace D, Randolph T, Olawoye J, Dipelou M and Kang'ethe E. 2008b. Participatory risk assessment: A new approach for safer food in vulnerable African communities. *Development in Practice* 18(4):611–618.

Solutions Exchange 2008. *Solutions exchange food and nutrition security community.* http://www.solutionexchange-un.net.in/food/cr/cr-se-food-02030901

Unnevehr L and Hirschhorn N. 2000. *Food safety issues in the developing world.* World Bank Technical Paper No. 469. The World Bank, Washington, DC, USA. 72 pp.

WHO (World Health Organization). 2006. *Core health indicators.* http://apps.who.int/whosis/database/core/core_select.cfm.

Chapter 10   Familiarity with consumer expectations to support smallholders: Demand for quality pork in Vietnam

Virginie Diaz Pedregal,[1] Nguyen Ngoc Luan,[2] Muriel Figuié[3] and Paule Moustier[4]

1. diaz@gret.org; was a postdoctoral scientist at Centre de coopération Internationale en Recherche Agronomique pour le Développement (CIRAD), Montpellier, France and is currently a sociologist at GRET, Nogent sur Marne, France
2. nguyenngocluan@gmail.com; researcher at the Rural Development Centre, Institute of Policy and Strategy for Agricultural and Rural Development, Hanoi, Vietnam
3. muriel.figuie@cirad.fr; researcher in sociology at CIRAD, Montpellier, France
4. moustier@cirad.fr; agricultural economist at CIRAD, Montpellier, France

Abstract

Economic growth in Vietnam and recurring food scandal incidents are prompting the demand for quality products. This paper explores consumer expectations with regard to pork, a very popular food item in Vietnam. The findings are based on a quantitative survey of 600 urban and rural households in Vietnam. The study focuses on consumer practices and assertions in the area of purchasing fresh and processed pork. The objective is to assist disadvantaged producers to better fit the supply with the new trends in consumption.

Key words: consumer preference, pork, quality, Vietnam

———————————————

Regional context and focus of the research

Over the past 20 years, Vietnam has moved from authoritarian political management to a free market economy. This change has led to unprecedented national economic growth. Economic development has been accompanied by increased demand for quality food and manufactured products (Cadilhon et al. 2006). These new markets present opportunities for local producers to earn more money. However, the status of the economy remains vulnerable, particularly for rural communities. Many producers in Vietnam eke a living from crops grown on smallholdings or from a few head of animals. Poverty in Vietnam remains a tangible reality. The Gross Domestic Product per capita is still low (USD 2600 in 2007), with limited access to health services, transportation and education (CIA World Factbook 2008).

The pork commodity chain in Hai Duong province (northern Vietnam) is representative of this overall economic context. Pork accounts for three-quarters of the meat consumed countrywide. However, small family-scale producers operate with precarious farm facilities and run the risk of being excluded from the growing demand as well as from input supply channels (Binh et al. 2007). According to the General Statistics Office, in 2006 the poverty rate in Hai Duong province was 17% and 24% for the whole country. With the increased cost of animal feed, small-scale farms in peri-urban zones are being replaced by large-scale industrial farms. The emerging demand for quality products can exacerbate this exclusion, as is the case in other countries where animal husbandry is undergoing integration and capitalization processes (Hayenga et al. 2000; Reardon and Berdégué 2002).

Meat consumption has increased sharply in recent years in Vietnam because of the rapid improvement in household living standards (le Danh et al. 2004). Of the meat products, pork has the highest annual per capita consumption rate (22 kg), ahead of poultry (5.6 kg) and beef (2.5 kg) (FAOSTAT 2003). In 2000, a survey of a representative sample of 181 households in Hanoi and 80 in Hai Phong showed that the most important pork quality attributes for consumers were colour, evidence of freshness, low fat and tenderness (Ginhoux 2001). In addition, 68% of interviewees said that the safety of pork was important. These findings were confirmed in 2002 by a survey of 200 households in Hanoi which found that pork ranked second on the list of food products about which consumers feel there are public health concerns (Figuié et al. 2004). For pork, these concerns are related to the likely presence of chemical residues such as growth hormones and antibiotics. Currently, consumers have little choice on the quality of pork available to them and their purchase decisions are governed essentially by fat content and packaging. With regard to food safety, the place of sale is viewed as a means of gauging quality, with greater trust in the safety of food products sold in supermarkets (Mayer 2006). The authors surveyed 20 points of sale and found that the price difference between lean and fatty pork was about 30%, and that

between cellophane-wrapped pork sold in supermarkets and pork sold in regular markets was 50–100%.

Despite being quite definitive, these studies do not show how purchasing practices, as well as perceptions of quality and especially food safety, vary from one type of consumer to another. However, such data are valuable in assessing market opportunities now available to producers who are in a position to take advantage of them, which is the thrust of this study.

Methodology

A questionnaire survey of 600 persons was conducted in April and May 2006. The questionnaire had four main sections: (1) pork consumption habits and level of consumer satisfaction, (2) willingness to pay for better quality pork, (3) comparison of former and current practices and assertions of pork consumers and (4) economic characteristics of the respondents. The objective of the research was to compare consumption practices among individuals from various localities and with different standards of living. The sample was therefore stratified by region and by market outlet. The survey covered three regions of northern Vietnam—Hanoi, Hai Duong and Nam Sach—representing three levels of urbanization; Hanoi is the capital of Vietnam, Hai Duong is an average-sized secondary city and Nam Sach is a rural commune. Interview respondents were chosen at random.

Out of the 200 consumers sampled in Hanoi, 120 were interviewed in supermarkets and 80 in regular markets. The 200 consumers sampled in Hai Duong and Nam Sach were interviewed in regular markets because supermarkets had not yet been set up in these zones. Only those persons in charge of making household food purchases were interviewed; as this task is often handled by women in Vietnam, it explains why 92% of the interviewees were female. Due to the small sample size in relation to the country as a whole, the findings of this survey can hardly be extended to the population of Vietnam at large. Nevertheless, they provide interesting insights because they enable comparisons among social groups regarding consumer behaviour patterns and expectations regarding purchased food products.

The assessment of consumers' willingness to pay for better quality fresh or processed pork used a series of attributes that were selected following discussions with hog raisers in the Nam Sach cooperative. The choice of these attributes was based on perceptions of Vietnamese consumer demand as well as on measures the hog raisers were prepared to take to improve the quality of fresh and processed pork. The attributes were as follows:

Fresh pork (pork fillet)

- Low intra- and extra-muscular fat
- Good colour

- Hygienic pig production and slaughter
- Pigs raised without use of industrially manufactured feed

Processed pork sausage (*gio*)

- No borax or monosodium glutamate (MSG) preservatives
- Wrapped in banana leaves only
- Wrapped in cellophane only
- Wrapped in banana leaves and cellophane

To determine the maximum amount that individuals were prepared to pay for all of these attributes, we used a pay card in incremental units of Vietnam dong (VND)[1] 500, corresponding to a price increase of 1% per kg. Interviewees were asked to use this scale to show the maximum additional price they were prepared to pay for 1 kg of fresh or processed pork that possessed a given attribute. Some authors have pointed out numerous biases induced when using various approaches to measure willingness to pay (Buzby et al. 1995; Golan and Kuchler 1999; Venkatachalam 2004). Such biases would often be due to the fact that interviewees are put in situations that are too hypothetical. Although using these approaches to measure willingness to pay has limits when attempting to assign a value to attributes, we nevertheless feel that such use in our study makes it possible to highlight preferences and to compare how such preferences line up for different groups of individuals.

Results

Demographic characteristics of the surveyed consumers

The family income of Hanoian consumers who bought fresh or processed pork at supermarkets was found to be higher than that of the other categories of consumers. A proportionately higher number of Hanoian consumers had university degrees, 75% were civil servants or company employees and most were aged between 25 and 40 years. Conversely, surveyed consumers in Nam Sach commune had low incomes (61% earned less than VND 2 million a month), low education levels (66% had secondary school education or lower), high dependence on farming (53%) and were relatively older than the national average (51% were aged between 41 and 55 years).

Consumers' purchasing practices for fresh and processed pork

The survey results confirmed the strong popularity of pork among Vietnamese consumers; 58% of those interviewed reportedly ate pork daily while 33% said they ate pork at least once a week. All those interviewed stated that they had eaten pork at least once in the previous three months. Reasons given for the widespread consumption of pork included low cost, ready availability and good flavour.

---

1. Vietnam dong (VND). In 2007, USD 1 = VND 16,119.

However, it is necessary to qualify consumer consumption of pork depending on the socio-economic features of the population. For instance, 79% of consumers in Nam Sach (a rural province) consumed pork daily compared to only 27% of consumers in Hanoi. Twenty-two percent of consumers who bought pork at supermarkets said they ate pork daily compared to 35% of consumers who bought pork in the regular markets. Similarly, 72% of low income households (earning less than VND 2 million/month) said that they ate pork daily, contrasted with 32% of those with high family incomes (over VND 5 million a month). Thus, pork consumption must be fitted into overall consumption patterns; where little pork is consumed, families may be very poor and have low animal protein intake or they may be wealthy with a diversified meat diet that may also include beef, poultry etc.

At the current prices, pork was the preferred meat product of 55% of surveyed consumers. There was a somewhat stronger preference among rural dwellers and households with average (VND 2–5 million) or low (less than VND 2 million) monthly incomes. For the same price, pork was ranked second in preference after beef although the latter was consumed less often.

On average, the consumers interviewed bought fresh pork at VND 41,500/kg and processed pork at VND 52,500/kg. Hanoians who bought pork at supermarkets and high income consumers paid more than the average price for fresh pork (VND 44,000 and 46,500/kg, respectively). Consumers in Nam Sach and lower income consumers, respectively, bought pork at VND 39,000 and 38,000/kg. A similar trend was noted for processed pork, which was sold in supermarkets in Hanoi for VND 60,000/kg compared to VND 48,000/kg in villages in Nam Sach.

Perceptions of safety of fresh and processed pork

The perception of pork quality must be viewed against the wider backdrop of how consumers gauge the safety of commercially sold food. The respondents felt rather pessimistic about the food safety situation in Vietnam: 43% of interviewees felt that food safety had worsened in the previous 10 years, while only 22% felt otherwise.

In general, 81% of respondents said that they were quite concerned (46%) or very concerned (35%) that they might be buying meat sourced from sick animals. Consumers were also afraid of bacterial contamination of food (76% of respondents), antibiotic and hormone residues in meat (67%), traces of artificial colouring and preservatives (68%) and pesticide residues on fruit and vegetables (75%). City dwellers, high income earners and young people were much more frequently concerned about food safety than rural dwellers and low income earners. For instance, 72% of Hanoians, 68% of high income earners and 58% of people aged between 16 and 24 years said they were very concerned about buying meat sourced from

sick animals, compared to only 21% of consumers in Nam Sach, 31% of low income earners and 44% of people aged over 55 years.

Moreover, the feeling of being able to deal with food safety issues varied with the location of the interviewees, with city dwellers having a greater feeling of helplessness; 49% of rural dwellers felt that they had some degree of control over food quality compared to only 29% of Hanoians. The feeling of control was also found to decrease with increasing level of income and increase with age. Sixty-seven percent of high income consumers felt that food quality was beyond their control compared to 49% of low income consumers. In addition, 69% of consumers aged 16–24 years felt that they had no control over the quality of the food they bought compared to 40% of people aged over 55 years. Therefore, urban, high income and young consumers were found to be more concerned overall and to feel more powerless in the face of health risks than other consumers.

Focussing specifically on pork, the interviewees trusted the hygiene of this product more than that of food in general. Thirty-five percent of consumers felt that pork hygiene had improved over the past decade, while 25% felt the opposite. Again, statistically significant differences were noted, depending on place of residence, source of pork and consumer income level. Forty-eight percent of Hanoians who bought pork in supermarkets felt that food safety had worsened over the past 10 years, compared to 40% of people living in Nam Sach; 42% of Hanoians who bought pork in supermarkets and 35% of high income consumers felt that pork hygiene had improved, compared to 28% of Nam Sach residents and 30% of low income consumers.

Consumers took a rather dim view of farmers who used industrially manufactured feed in pork production, for both health and flavour reasons. The majority (57%) of consumers felt that pork from pigs reared on industrial farms had less fat than that from traditionally reared pigs, but the risk of finding chemical residues in the meat was greater (51% of responses) and the flavour of the meat was affected (52%). Hanoian consumers expressed the greatest concern on these points: 65% of them were afraid that raising hogs on manufactured feed would lead to high levels of chemical residues in the meat compared to 23% of people in Nam Sach. Fifty-eight percent of high income consumers expressed a similar opinion compared to 40% of the low income consumers.

Consumers stated that the most important factors influencing decisions when buying pork were food safety (34% of respondents), price (22%) and habit (19%). Altogether, 63% of respondents stated that hygiene was a major concern when buying fresh pork, with 70% of Hanoians and 55% of Nam Sach residents expressing their concern about this. Higher income consumers (73% of respondents) were also found to be more sensitive to matters of

pork hygiene than lower income consumers (60%), as were younger consumers aged 16–24 years (73%) than those aged over 55 years (58%).

Although, in the main, most consumers (62%) felt quite satisfied with the quality of purchased fresh pork, a different picture emerged for consumers of processed pork, 51% of whom said that they were quite unsatisfied and 12% very unsatisfied. The greatest concern was over the presence of residues of borax (a chemical antiseptic) in processed pork; 44% of consumers were totally unsatisfied and 16% quite unsatisfied with this quality aspect. Hanoians and high income earners were more frequently bothered by the problem of borax (75% and 70% of respondents, respectively) than consumers in Nam Sach and low income families (36% and 51%, respectively).

Willingness to pay for quality pork

To ascertain the willingness to pay for better quality pork, consumers were asked if they were prepared to pay a higher price for fresh pork with less extra-muscular fat, some intra-muscular fat, good colour and better hygiene that was sourced from pigs of a local race and raised on manufactured feed. They were also asked if they were willing to pay more for processed pork (sausages) with no borax or MSG, wrapped in banana leaves and/or cellophane. Those who were willing to pay more were asked how much more they would be prepared to pay for each quality attribute.

Over half of the surveyed consumers were willing to pay more for fresh pork with guaranteed improved hygiene (Table 10.1). Over a third (36%) of respondents were willing to pay more for pork with a good colour, 30% for pork with less extra-muscular fat, 26% for pork from pigs not raised on manufactured feed and 25% for pork with less intra-muscular fat. Furthermore, 80% of consumers said that they were willing to pay more than what they were used to for fresh pork that had the top three preferred features: guaranteed improved hygiene, good colour and less extra-muscular fat.

Consumers who were willing to pay a premium were prepared to spend, on average, up to VND 2000 more per kg for fresh pork with better hygiene (5% above the average price) and up to VND 1800 more per kg for pork with good colour or less extra-muscular fat. Willingness to pay for pork from pigs not raised on manufactured feed and pork with less intramuscular fat was, respectively, VND 1700 and VND 1600. Consumers were willing to pay twice that amount for pork with improved hygiene, nicer colour and less extramuscular fat.

Consumers' willingness to pay for quality was even greater for processed pork. Over 60% of the consumers interviewed were prepared to pay more for pork sausages that did not contain

residues of borax or chemical preservatives; 44% were willing to pay more if they had a guarantee that the processed pork they were buying was free of MSG or if it was packaged in banana leaves or cellophane. Seventy-eight percent of respondents said that they would be willing to pay more for sausages guaranteed to have no borax/chemical preservative residues and MSG (Table 10.2).

Table 10.1. *Willingness to pay more for fresh pork based on socio-economic characteristics of respondents and characteristics of the product to be purchased*

		Improved hygiene (1)		Nicer colour (2)		Less extra-muscular fat (3)		Not raised on manufactured feed		Less intra-muscular fat		Fresh pork with (1), (2) and (3)	
		%	Premium (VND)	%	Pre-mium (VND)	%	Pre-mium (VND)	%	Pre-mium (VND)	%	Pre-mium (VND)	%	Pre-mium (VND)
Monthly family income (million VND)	< 1	8	(500)	0	(0)	0	(0)	0	(0)	0	(0)	8	(700)
	1–2	39	1300	18	1300	11	1200	8	1000	6	1000	59	2300
	3–4	46	1800	29	1600	27	1300	21	1200	22	1300	85	3100
	5–6	71	2500	62	1900	49	2000	47	1700	44	1800	98	4000
	7–8	62	3100	66	2200	62	2200	53	2400	40	1700	100	5000
	> 8	86	3800	68	3100	59	2600	59	3200	59	2400	100	7300
Place of residence and where pork is purchased	Hanoi super-market	66	3000	65	2300	52	2500	39	2400	46	2300	100	5200
	Hanoi regular market	73	2300	67	1900	44	1900	48	1500	48	1500	93	3900
	Hai Duong	51	2000	31	1500	27	1400	27	1500	18	1100	90	3400
	Nam Sach	33	1000	13	1000	15	900	9	1100	9	700	51	1600
Overall average		51	2100	36	1800	30	1800	26	1700	25	1600	79%	3500

Data in parentheses are not statistically valid because of the low number of respondents interviewed.

Consumers who were willing to pay a premium for quality processed pork were prepared to pay, on average, up to VND 2500 more per kg for borax- and preservative-free pork (5% above the average price), VND 2000 more per kg for MSG-free pork and VND 1500 more per kg for sausages packaged in either banana leaves or cellophane wrap. However, these figures are to be considered in the light of the financial status (measured by household monthly income), place of residence, level of education, occupation and, to a lesser extent, age of the respondents. Tables 10.1 and 10.2 detail all of the data on the preferred quality criteria.

It is noteworthy that 86% of respondents with a monthly family income of VND 8 million or higher were prepared to pay a premium price for fresh pork with guaranteed hygiene

compared to 8% of persons earning less than VND 1 million. The same trend was observed for the other quality attributes of fresh and processed pork.

Table 10.2. *Willingness to pay more for processed pork based on socio-economic characteristics of respondents and characteristics of the product to be purchased*

		No borax or chemical preservative (1)		No MSG (2)		Packaged in banana leaves and cello-wrap		Processed pork with (1) and (2)	
		% respondents	Premium (VND)	% respondents	Premium (VND)	% respondents	Premium (VND)	% respondents	Premium (VND)
Monthly family income (million VND)	< 1	4	(500)	0	(0)	16	(500)	20	(700)
	1–2	36	1600	25	1600	31	1200	64	2300
	3–4	60	2200	40	1700	35	1500	77	3100
	5–6	86	2700	68	2000	62	1600	96	4000
	7–8	94	3500	68	2400	74	1700	100	5100
	> 8	100	4500	82	3000	86	2500	100	7300
Place of residence and where pork is purchased	Hanoi super-market	92	3500	64	2600	59	1800	95	5200
	Hanoi regular market	83	2400	71	2000	44	2000	88	3900
	Hai Duong	60	2400	52	1700	49	1600	87	3400
	Nam Sach	35	1400	15	1100	30	900	54	1600
Overall average		61	2600	44	2000	44	1500	78	3500

Data in parentheses are not statistically valid because of the low number of respondents interviewed.

Similarly, 66% of Hanoians who bought pork from supermarkets were reportedly prepared to pay more for fresh pork of guaranteed hygiene compared to 51% of consumers in Hai Duong and 33% of those in Nam Sach. The proportion was identical for the other characteristics of quality fresh and processed pork. Premiums for quality pork showed a similar pattern; overall, Hanoians who bought their pork at supermarkets were more inclined to pay more for quality fresh and processed pork than those who shopped at regular markets, and even more so than consumers in Hai Duong and Nam Sach. While willingness to pay for quality pork depends greatly on the socio-economic characteristics of the respondents, consumption practices also have an effect on patterns observed.

When frequency of pork consumption was crossed with willingness to pay more for quality pork, it was noted that Vietnamese consumers who ate pork daily were least willing to pay more. Thus, 63% of people who ate pork a few times a year were prepared to pay more for their meat if it had a safety guarantee compared to only 43% of persons who ate pork daily. This can be explained in part by the fact that regular consumers of pork are in the lowest income bracket. Indeed, 77% of regular pork consumers had a monthly family income of VND 3 million or lower. The wealthiest respondents preferred to eat beef or fish more often.

Thus, the poorest of the poor were unwilling to pay more for pork, even if it had a guarantee of better quality.

It is also noteworthy that consumers whose preferred meat product, at equal price, was pork were not particularly consumers who would agree to pay more to get a quality product. Thus, 43% of pork eaters said they were willing to pay more for fresh pork with better hygiene, while 57% of beef eaters and 58% of fish eaters were of the same opinion. The taste for meat is therefore of secondary consideration in explaining willingness to pay for quality pork. On average, individuals were more prepared to pay for pork with no residues of borax or chemical preservative than for MSG-free pork or pork packaged in banana leaves or cellophane wrapping; this trend was more prevalent for financially well-off urban consumers than their rural counterparts.

Discussion and conclusion

It can be taken for granted that consumers want to purchase quality products. All consumers interviewed said that they were aware of the importance of food safety for themselves, their children and the environment in general. Most consumers interviewed in this survey felt that safe fresh or processed pork was directly linked to hygiene and the absence of antibiotic or hormone residues in the meat. They also linked it to colour as an indicator of freshness, the amount of fat and whether or not the animals were raised on manufactured food. Concern for safety was seen in the higher income consumers' willingness to pay for better quality products.

Although consumers were quite sensitive to intrinsic quality criteria in the purchased products (no preservative/pesticide residues; nice colour, low fat content etc.), the extrinsic criteria of the products were not totally left out when consumers made their purchasing decisions. Indeed, the willingness to pay for the external characteristics of the product, such as packaging, was also high when considering a combination of various types of packaging for pork, such as cellophane wrap and banana leaves. Of course, these external trappings (packaging or place of purchase) are assumed to give evidence of the internal characteristics of the product; cellophane wrap is associated with hygiene, banana leaves with tradition, a supermarket with food safety etc.

Today, although hog raisers must be made aware of what they can gain from quality commodity chains, a number of questions are left unanswered. For instance: Are the most disadvantaged producers technically able to build quality commodity chains to meet the stringent demands of urban consumers? To what extent will the extra price paid by the consumer reach the pocket of the producer? What distribution modes linking food safety and economic efficiency should receive priority?

One possibility for rural producers to improve their standards of living is to join producer co-operatives or associations. The latter have a number of advantages, for instance, they ensure collective advocacy of interests in dealing with domestic purchasers, promote access to relevant information on pork sold in regular markets and consumer expectations, enable a reduction of the costs of accessing feed and veterinary services and facilitate issuance of certificates of quality that build purchaser trust. In Vietnam, such associations are already operating, as is the case in Nam Sach commune, Hai Duong province (Binh et al. 2007).

References

Binh VT, Thai BT, Quang HV and Moustier P. 2007. *The role of farmer organisations and researcher support in the inclusion of smallholders in quality pork supply chains in Vietnam.* Presentation to the 106th seminar of the European Association of Agricultural Economists (EAAE), Montpellier, France, 25–27 October 2007. Agecon, http://agecon.lib.umn.edu

Buzby JC, Skees JR and Ready RC. 1995. Using contingent valuation to value food safety: A case study of grapefruit and pesticide residue. In: Caswell J (ed), *Valuing food safety and nutrition.* Westview Press, Boulder, Colorado, USA.

Cadilhon JJ, Moustier P, Poole ND, Phan TGT and Fearne AP. 2006. Traditional vs. modern food systems? Insights from vegetable supply chains to Ho Chi Minh City (Vietnam). *Development Policy Review* 24(1):31–49.

CIA World Factbook. 2008. *Vietnam.* https://www.cia.gov/library/publications/the-world-factbook/geos/vm.html

le Danh T, Le Bach M, Figuié M, Bricas N, Maire B, Dop MC, Nguyen DC and Nguyen CK. 2004. Evolution de la consommation alimentaire et de l'état nutritionnel des populations urbaines au Vietnam au cours des vingt dernières années. *Cahiers Agricultures* 13(1):31–38.

FAOSTAT. 2003. *Archives, food balance sheet, Vietnam.* http://faostat.fao.org/ Accessed 16 July 2008.

Figuié M, Bricas N, Nguyen TVP and Truyen ND. 2004. Hanoi consumers' point of view regarding food safety risks: An approach in terms of social representation. *Vietnam Social Sciences* 3(101):63–72.

Ginhoux V. 2001. *Etude de la sensibilité des consommateurs urbains de viande porcine (Hanoi et Haiphong, Vietnam).* Hanoi, GRET, VASI, VSF, CIRAD, Programme Fleuve Rouge.

Golan E and Kuchler F. 1999. Willingness to pay for food safety: Costs and benefits of accurate measures. *American Journal of Agricultural Economics* 81:1185–1191.

Hayenga M, Schroeder T, Lawrence J, Hayes D, Vukina T, Ward C and Purcell W. 2000. *Meat packer vertical integration and contract linkages in the beef and pork industries: An economic perspective.* Working Paper, Iowa University, Iowa, USA. 103 pp.

Mayer J. 2006. *Impacts des modes de distribution sur la perception des signes de qualité: Perceptions des consommateurs d'Hanoi, Vietnam. Cas des légumes, des poulets et des œufs.* ERITA/CIRAD. Université de Toulouse le Mirail Toulouse, France. 130 pp.

Reardon T and Berdégué JA. 2002. The rapid rise of supermarkets in Latin America: Challenges and opportunities for development. *Development Policy Review* 20(4):371–388.

Venkatachalam L. 2004. The contingent valuation method: A review. *Environmental Impact Assessment Review* 24(1):89–124.

Chapter 11 Estimating willingness to pay for quality and safety attributes of pork: Some empirical evidence from northern Vietnam

Ma. Lucila A Lapar,[1] Nguyen Ngoc Luan,[2] Mohammad A Jabbar,[3] Muriel Figuié,[4] Hoang Vu Quang,[5] Paule Moustier,[6] Vu Trong Binh[7] and Steve Staal[8]

1. l.lapar@cgiar.org; research scientist at the International Livestock Research Institute (ILRI), Hanoi, Vietnam

2. nguyenngocluan@gmail.com; researcher at the Rural Development Centre, Institute of Policy and Strategy for Agricultural and Rural Development, Hanoi, Vietnam

3. mjabbar2@gmail.com; was a senior agricultural economist at ILRI, Addis Ababa, Ethiopia and is currently a consultant agricultural economist in Dhaka, Bangladesh

4. muriel.figuie@cirad.fr; researcher in sociology at Centre de coopération Internationale en Recherche Agronomique pour le Développement (CIRAD), Montpellier, France

5. quangvh@fpt.vn; vice director of the Rural Development Centre, Institute of Policy and Strategy for Agricultural and Rural Development, Hanoi, Vietnam

6. moustier@cirad.fr; agricultural economist at CIRAD, Montpellier, France

7. trongbinh@fpt.vn; director of the Rural Development Centre, Institute of Policy and Strategy for Agricultural and Rural Development, Hanoi, Vietnam

8. s.staal@cgiar.org; research scientist at ILRI, Nairobi, Kenya

Abstract

This study assessed consumers' willingness to pay a premium for specific quality and safety attributes of pork and the accompanying socio-economic factors that influence this choice decision. A survey was conducted among 600 randomly selected consumers from three regions in northern Vietnam representing three levels of urbanization: Hanoi as an urban centre, Hai Duong as an average-sized secondary city and Nam Sach as a rural commune. A dichotomous choice model was estimated to examine the factors that influenced the likelihood of willingness to pay a premium for selected quality and safety attributes that were identified as important by Vietnamese consumers in previous studies and through stakeholder consultations.

The results provide empirical support to validate some stylized facts about consumer preferences for specific attributes of fresh pork and a traditional processed pork product, *gio*. Socio-demographic characteristics of consumers influence their preference for specific attributes and, specifically, the nature of their demand for such attributes. Household income and location were found to be strong determinants of preferences and hence should be

given due consideration when designing production and marketing strategies for fresh and processed pork. Higher household income was strongly evident as a factor for increasing demand for quality attributes such as lower fat content, better hygiene and more desirable nicer colour (associated with freshness), but also for traditional attributes associated with products from niche markets such as meat from pigs reared without industrial feed or from local pigs. Higher level of education of consumers was also associated with lower likelihood of willingness to pay a premium for pork from pigs with more exotic blood. These results suggest that there is a group of consumers who demand quality attributes of hygienic, fresh and low-fat pork and these are relatively high income, well-educated consumers in Hanoi. Similarly, these consumers also preferred pork with local flavour/taste (e.g. from local pigs and pigs reared without industrial feed) that may be met by producing pork from crossbreeds with high local blood content and reared on traditional feeds such as grasses and local or mixed feeds as opposed to industrially processed feed.

These findings can be used to guide strategies for designing production and marketing options that can be piloted by a small group of collaborating households. Given the differential preference behaviour for different pork attributes by different types of consumers, there is need to identify target consumers for better targeting of interventions that can be prescribed on the ground. Efforts to ensure credibility and reputation for delivering products with these stated attributes will also need to be given attention.

Key words: consumer preference, willingness to pay, quality, safety, pork, Vietnam

Introduction

Demand for quality as a driver of markets and production is appearing as a global phenomenon (Reardon et al. 2001; Humphrey 2005; King and Venturini 2005; Regmi and Gelhar 2005). Rising consumer incomes, changing demographic patterns and lifestyles, and shifting preferences due to new information about the links between diet and health all contribute to new demands for food (Jensen 2006). At the same time, technological changes in production, processing and distribution, structural change and growth in large-scale retailing, and expansion of trade worldwide have contributed to a rapidly changing market for food products. These recent developments are reflected in the changes in demand for meat and other animal products.

In Vietnam, where incomes are rising due to the country's economic reforms over the last decade and the ensuing urbanization has accompanied economic growth, increased product (and price) differentiation is emerging as evidence of increasing demand for better quality products among urban consumers and of willingness to pay differential prices based on such attributes (Ginhoux 2001; Figuié and Dao 2002; Moustier 2006; Tung 2006; World Bank 2006). Further, demand for better quality is reflected both in the demand for commercial as well as traditional product attributes, with the latter increasingly becoming important with the emerging niche markets for particular pork products or those with certain attributes.

This study was aimed at assessing Vietnamese consumers' willingness to pay for specific attributes of quality and safety in pork and the accompanying socio-economic factors that drive this behaviour. It is hoped that the results of this research will inform action research for pilot testing of specific interventions that will facilitate more effective production and marketing strategies tailored to fit smallholder pig producers' resources and conditions that will subsequently allow them to participate more effectively in the changing markets for pork in Vietnam. Understanding the drivers of consumer behaviour is an important initial step to achieve this overall objective (see for example Sanders et al. 2004).

Modelling willingness to pay

Survey methodology

A survey was conducted covering a sample of 600 consumers living in three regions of northern Vietnam: Hanoi, Hai Duong and Nam Sach, representing three levels of urbanization. Hanoi is the capital of Vietnam, Hai Duong an average-sized secondary city and Nam Sach a rural commune. Out of the 200 consumers interviewed in Hanoi, 120 were met in supermarkets and 80 in regular markets. The 200 consumers each from Hai Duong and Nam Sach were interviewed in regular markets because supermarkets had not

yet been set up in these zones. The respondents in each category were chosen at random; customers were interviewed on the scene, on a one-to-one basis. Only persons in charge of food purchasing in the household were interviewed, a task most often handled by women in Vietnam which explains why 92% of interviewees were female. The contingent valuation method (CVM) is a standard approach to elicit willingness to pay through dichotomous choice, market-type questioning with a direct survey. In the dichotomous choice CVM, respondents are asked whether they would be willing to pay a particular price for a particular good in a hypothetical market, letting them answer 'yes' or 'no' to the 'bid' amounts offered.

In our survey, a contingent valuation question regarding willingness to pay a premium for fresh pork and *gio* (locally processed pork sausage) was included. Survey respondents were asked if they were willing to pay a premium for fresh pork and *gio* with specific attributes (other than the regular fresh pork and *gio* they usually purchased) and if so, to indicate using a payment card how much more than the current price they would be willing to pay in increments of VND 500 until the maximum amount they would be willing to pay. A similar question was then asked about a hypothetical product, i.e. fresh pork with less extramuscular fat, nicer colour and guaranteed hygiene and *gio* with no borax and MSG compared to what they usually bought. Full details of the descriptive statistics of the survey results are presented by Luan et al. (2006) and Pedregal et al. (in this volume). The primary focus of this paper is econometric analysis of the data as descriptive analysis cannot adequately or satisfactorily disentangle the effects of different factors.

The econometric model

Product attributes can be categorized into search, experience and credence goods (Nelson 1970; Darby and Karni 1973; Nelson 1974 as cited in Mojduszka and Caswell 2000) and, in most cases, attributes associated with quality are credence or experience goods and thus not easily observable without additional quality signals. Given this information asymmetry in the market of experience and credence goods, eliciting a consumer's true demand for specific quality attributes would require transforming credence and experience attributes into search attributes through provision of information about food quality through some visible quality signals. An alternative approach is to derive demand via a consumer's stated preference for specific attributes and assign a value to it. This can be done using a contingent valuation approach that was used in this study to elicit a consumer's willingness to pay for specific quality and safety attributes of fresh and processed pork.

The binary dichotomous choice CVM was applied to examine survey data on willingness to pay. Two outcomes were possible, namely, the respondent was either not willing to pay a premium for the fresh pork or *gio* with specific attributes (responded 'no' to the willingness-to-

pay question) or willing to pay a premium (responded 'yes' to the willingness-to-pay question). Probit, a dichotomous choice model, was used to examine the factors that influenced the likelihood of willingness to pay for a particular set of attributes (Maddala 1983; Greene 1997). The choice of which specific attributes to include for investigation were based on previous surveys by Ginhoux (2001) and Figuié and Dao (2002) that indicated what attributes were important to Vietnamese consumers, and also determined in consultation with stakeholders in Hai Duong province (Figuié et al. 2006). Models were run on STATA version 9.

It was hypothesized that consumers were heterogeneous with regard to their tastes in that they differed in the types and levels of quality that they desired when making their purchase decisions. This was subsequently reflected in their willingness to pay for products with the desired attributes. This heterogeneity in tastes might be conditioned by socio-demographic factors, including consumer perceptions and attitudes about quality (Carriquiry and Babcock 2005). For example, socio-demographic variables influence household demand for product and product attributes by altering the utility derived from goods and/or the costs of household production (Miller and Unnevehr 2001). Hence, for the present study, factors that were hypothesized to affect the likelihood of willingness to pay for specific attributes included socio-demographic characteristics such as household income, household size, gender, age, education and location. Variables that proxy for consumer attitudes about specific attributes were also included. Purchase habits such as frequency of purchase and choice of outlets, as well as consumption of other types of meats as substitutes, were likewise hypothesized to influence willingness to pay. Table 11.1 summarizes the socio-demographic characteristics of the survey respondents.

Results and discussion

Willingness to pay for fat content in fresh pork

Willingness to pay for three different forms of fat content was solicited: less extramuscular fat, more intramuscular fat and less intramuscular fat. Households in Hai Duong and Nam Sach were less likely to be willing to pay for pork with less extramuscular fat compared to households in Hanoi (Table 11.2). Higher income households, households that bought a higher proportion of their fresh pork in supermarkets, and those who ate beef once a week were more likely to be willing to pay for pork with less extramuscular fat. On the other hand, households that bought fresh pork less frequently in supermarkets, households for whom safety and fat content of meat were important factors in purchase decisions, and households that were satisfied with the breed of slaughtered pig sold as fresh pork were less likely to be willing to pay for less extramuscular fat in pork.

Table 11.1. *Socio-demographic characteristics of survey respondents*

| | Percentage of respondents | | | |
	Hanoi	Hai Duong	Nam Sach	All
Gender				
% female	90	95	91	92
Age (years)				
16–24	19	13	4.5	12
25–40	43	38	35.5	38
41–55	32	40	51	41
>55	7	9	9	8
Total	100	100	100	100
Mean	39.4	42.7	39.6	36.7
Education (years)				
No school	0	4	10	5
Primary and secondary school	5	18	56	26
High school (class 10–12)	20	28	25	24
Undergraduate	17	11	3	10
Postgraduate	59	39	7	35
Total	100	100	100	100
Main occupation				
Government/private sector employee	68	36	8	37
Unskilled labour	7	14	16	13
Agricultural producer	1	10	52	21
Student	12	11	3	8
Retired, not working	7	12	9	10
Merchant	5	17	12	11
Total	100	100	100	100
Household size				
Mean	4.26	4.41	4.33	4.33
Number of children < 10 years	0.35	0.39	0.31	0.35
Number of people > 60 years	0.22	0.19	0.21	0.21

Source: Consumer survey, DURAS Project (2006).

Specifically, consumers who bought pork at least once a month in supermarkets had a 16% lower probability of paying a premium for pork with less extramuscular fat. This was relatively lower than the predicted likelihood of non-payment of a premium by a consumer who was most concerned about safety (21%) or the lean meat content of pork (27%), but higher than the predicted likelihood of non-payment of a premium by a consumer who was satisfied with the breed of the slaughtered pig (14%). In terms of location, consumers from Hai Duong and Nam Sach were less willing to pay a premium for less extramuscular fat in pork than consumers from Hanoi; that is, a consumer in Hai Duong had an 18% lower probability of paying a premium for pork with less extramuscular fat compared to a consumer in Hanoi while a consumer in Nam Sach had a 14% lower probability of paying a premium for the same attribute compared to a consumer in Hanoi.

143

Table 11.2. *Factors influencing willingness to pay for less extramuscular fat, more extramuscular fat and less intramuscular fat in pork*

Variable	Less extramuscular fat		More intramuscular fat		Less intramuscular fat	
	Estimated coefficient	Marginal effect	Estimated coefficient	Marginal effect	Estimated coefficient	Marginal effect
Location dummy (Hai Duong = 1)	−0.588*** (0.228)	−0.176*** (0.063)	−1.195** (0.580)	−0.002 (1.190)	−0.940*** (0.234)	−0.220*** (0.048)
Location dummy (Nam Sach = 1)	−0.475* (0.285)	−0.144* (0.081)			−1.145*** (0.299)	−0.258*** (0.056)
Income of household	0.163*** (0.036)	0.053*** (0.012)			0.160*** (0.002)	0.043*** (0.001)
Market outlet						
% of fresh pork bought at supermarket	0.016** (0.008)	0.005** (0.003)				
Buy pork monthly at super-market	−0.588* (0.322)	−0.159** (0.070)				
Consumption pattern						
Consume beef at least once a week	0.441* (0.250)	0.150* (0.088)				
Consume beef at least once a month					0.450* (0.253)	0.118* (0.064)
Consume buffalo at least once a month					1.899* (1.008)	0.658** (0.261)
Consume buffalo at least once a year					1.721* (0.988)	0.524* (0.294)
Never consume buffalo					1.748* (0.984)	0.405** (0.194)
Consume duck at least once a year					−1.079* (0.556)	−0.279** (0.137)
Consume fish at least once a week			−1.471** (0.726)	−0.006 (3.312)		
Consume fish at least once a month			−1.191* (0.697)	−0.001 (0.554)		
Important factors considered in meat purchase						
Safety is the most important factor	−0.701* (0.414)	−0.207* (0.111)				
Fat content is the most impor-tant factor	−1.650*** (0.633)	−0.266*** (0.032)				
Satisfaction with attributes						
Satisfied about race of fresh pork	−0.392* (0.221)	−0.138* (0.083)	−0.792* (0.467)	−0.003 (1.548)		
No. of observations	596		357		596	
LR Chi²	153.06		48.27		152.52	
Pseudo R²	0.21		0.325		0.229	

Standard errors in parentheses. * Significant at 10%; ** significant at 5%; *** significant at 1%.
Source: Consumer survey, DURAS Project (2006).

Location, consumption of fish and level of satisfaction with pig breed were the factors that significantly affected Vietnamese consumers' willingness to pay for pork with more intramuscular fat (Table 11.2). Specifically, consumers who consumed fish at least once a week or once a month, and those who were satisfied with the pig breed were less willing to pay a premium for more intramuscular fat in pork, although the likelihood of non-payment of a premium was below 1% for each of these covariates. Also, consumers from Hai Duong were less willing to pay a premium for this attribute (with less than 1% probability) than consumers from Hanoi. Household income was not a significant factor in influencing consumers' willingness to pay for more intramuscular fat in pork.

Factors affecting Vietnamese consumers' willingness to pay for pork with less intramuscular fat included household income, location and consumption of other meats like beef, buffalo meat, and duck (Table 11.2). Specifically, consumers with higher incomes were more willing to pay a premium for pork with less intramuscular fat, where a 1% increase in income would increase by 4% the probability of a consumer's willingness to pay for pork with this attribute. Also, consumers who ate beef at least once a month and buffalo meat at least once a month or year were willing to pay more for pork with less intramuscular fat. Consumers who never ate buffalo meat were more willing to pay for this specific attribute. It was expected that consumption of buffalo meat would increase the likelihood of a consumer's willingness to pay for less intramuscular fat in pork, with probabilities ranging from 40–66% depending on the frequency of consumption, with non-consumption having the lowest predicted probability (40%) among them. Consumers who ate duck meat at least once a year, on the other hand, were less willing to pay a premium for pork with less intramuscular fat, with likelihood of non-payment predicted at 28%. In terms of location, consumers from Hai Duong and Nam Sach were less willing to pay a premium for pork with less intramuscular fat than those from Hanoi, with expected probabilities at 22% and 26%, respectively. Consumers in Hai Duong also appeared to have relatively stronger preference for pork with less intramuscular fat (marbling) than consumers in Nam Sach and Hanoi.

Willingness to pay for pork from pigs of different breeds and feeding systems

Factors that significantly affect Vietnamese consumers' willingness to pay for pork from exotic pigs are education, choice of market outlet, and consumption of other types of meat (Table 11.3).

Table 11.3. *Factors influencing willingness to pay for pork from exotic and local pig breeds and from pigs fed with industrial feed*

Variable	With industrial feed		Pork from exotic breed		Pork from local breed	
	Estimated coefficient	Marginal effect	Estimated coefficient	Marginal effect	Estimated coefficient	Marginal effect
Location dummy (Hai Duong = 1)	1.660*	0				
Location dummy (Nam Sach = 1)						
Income of household	0.215* (0.127)	0			0.271*** (0.043)	0.055*** (0.009)
Education of respondent			–0.074*	–0.007*		
Market outlet						
% of processed pork bought at supermarket			–0.163* (0.089)	–0.016** (0.008)		
Buy pork weekly at open market	24.402*** (2.01)	1.000***				
Buy pork weekly at super-market			1.170** (0.587)	0.224 (0.163)		
Buy pork monthly at super-market			1.170** (0.587)	0.224 (0.163)		
Consumption pattern						
Consume pork daily	24.084 (0.000)	1.000*** (0.001)				
Consume buffalo at least once a week	22.657 (70.75)	1.000*** (0.000)				
Never consume buffalo	–1.716** (0.729)	0 (0.003)				
Never consume duck			–0.643* (0.356)	–0.059* (0.031)		
Consume fish at least once a week			–0.977* (0.583)	–0.131 (0.101)	0.832* (0.458)	0.163* (0.087)
Consume fish at least once a month			–1.280** (0.623)	–0.090** (0.037)		
Satisfaction with attributes						
Satisfied about race of fresh pork					–0.801*** (0.234)	–0.226*** (0.082)
No. of observations	236		346		568	
LR Chi^2	39.8		40.08		117.48	
Pseudo R^2	0.481		0.192		0.228	

Standard errors in parentheses. * Significant at 10%; ** significant at 5%; *** significant at 1%.
Source: Consumer survey, DURAS Project (2006).

Specifically, consumers who bought pork from supermarkets at least once a week, month or year were more willing to pay a premium for this attribute. On the other hand, consumers who purchased a larger share of processed pork products from supermarkets, never consumed duck meat and consumed fish at least once a week or month were less

willing to pay a premium for pork from exotic pigs. Note that the effect of education on the likelihood of a consumer's willingness to pay for pork from exotic breeds was much less than that of choice of market outlet, specifically weekly purchase from supermarkets (less than 1% *vis-à-vis* 77%, respectively). Since exotic pig breeds are highly associated with pork with high lean meat content, this finding suggests that three out of four consumers who frequently shopped in supermarkets had a higher probability of paying a premium for lean meat. Fish consumption, on the other hand, lowered the probability (by 9–13%, depending on frequency) that a consumer would be willing to pay a premium for this same attribute. Location and household income did not significantly influence willingness to pay for this attribute, unlike the other attributes as previously shown. On the other hand, the effect of a one-unit increase in education would result in a less-than-one-unit increase in the probability that a consumer would be willing to pay a premium for this attribute.

Vietnamese consumers' willingness to pay for pork from local pigs was found to be significantly influenced by household income, fish consumption and level of satisfaction with pig breed (Table 11.3). Specifically, a 1% rise in household income would increase by 6% the probability that a consumer would be willing to pay a premium for pork from local breeds. Households consuming fish at least once a week were also more willing to pay a premium for this attribute with 16% probability. On the other hand, consumers who indicated being currently satisfied with the pig breeds in the market were less willing to pay a premium for pork from local pigs with 23% probability. Note that pork from local breeds was generally associated with higher fat content.

Vietnamese consumers' willingness to pay for pork from pigs raised on industrial feed was significantly influenced by household income, location, choice of market outlet and consumption of other types of meat (Table 11.3). Specifically, consumers with higher household income, who bought pork at least once a week from open-air markets, and who lived in Hanoi were more willing to pay a premium for this attribute. Higher probabilities of willingness to pay for this attribute were predicted among consumers who purchased pork from wet markets and consumed pork daily and buffalo meat at least once a week. On the other hand, consumers who never ate buffalo meat were less willing to pay a premium for this attribute.

Vietnamese consumers' willingness to pay for pork from pigs raised without industrial feed was significantly affected by household income, location, beef consumption and level of satisfaction with pork attributes (Table 11.4). Specifically, consumers with higher household incomes and who ate beef at least once a week were more willing to pay a premium for this attribute. A 1% rise in household income would increase the probability of willingness to pay by 6%, while consumers who consumed beef at least once a week had a 21% probability of

paying a premium for pork from pigs reared without industrial feed. On the other hand, those consumers who were satisfied with the colour of pork that was currently available were 9% less likely to pay a premium for this attribute. Also, consumers from Nam Sach were 17% less likely to pay a premium for this same attribute than those from Hanoi.

Table 11.4. *Factors influencing willingness to pay for pork with nicer colour and better hygiene, and from pigs reared without industrial feed*

Variable	Nicer colour		Better hygiene		From pigs reared without industrial feed	
	Estimated coefficient	Marginal effect	Estimated coefficient	Marginal effect	Estimated coefficient	Marginal effect
Location dummy (Hai Duong = 1)	−1.105*** (0.228)	−0.347*** (0.061)	−0.724*** (0.220)	−0.282*** (0.081)		
Location dummy (Nam Sach = 1)	−1.655*** (0.293)	−0.475*** (0.062)	−0.996*** (0.267)	−0.378*** (0.091)	−0.625** (0.294)	−0.168** (0.071)
Income of household	0.145*** (0.037)	0.052*** (0.013)	0.116*** (0.036)	0.046*** (0.014)	0.207*** (0.010)	0.061*** (0.001)
Market outlet						
Buy pork weekly at supermarket	−1.643** (0.730)	−0.308*** (0.039)				
Consumption pattern						
Consume beef at least once a week					0.642**	0.208**
Satisfied about colour of fresh pork					−0.297** (0.139)	−0.091** (0.044)
No. of observations	596		598		592	
LR Chi²	194.83		108.89		141.96	
Pseudo R²	0.25		0.131		0.207	

Standard errors in parentheses. * Significant at 10%; ** significant at 5%; *** significant at 1%.
Source: Consumer survey, DURAS Project (2006).

Willingness to pay for pork with nicer colour and better hygiene

Vietnamese consumers' willingness to pay for pork with nicer colour was influenced by their household income, location and choice of market outlet (Table 11.4). In the context of this study, 'nicer colour' was associated with reddish as opposed to pale pink colour; pale colour was generally less desired as an indicator of good quality fresh pork. The more desirable nicer colour of pork was associated with relatively higher quality. Specifically, consumers with higher income were willing to pay a premium for pork with nicer colour, with 5% likelihood for every 1% increase in income. On the other hand, consumers who purchased pork at least once a week from supermarkets were less willing to pay a premium for pork with nicer colour, with 31% probability of non-payment. Consumers from Hai Duong and Nam Sach were less willing to pay a premium for this attribute than those from Hanoi. The likelihood of non-willingness to pay was higher in Nam Sach (48%) than in Hai Duong (35%), suggesting

that colour as a quality attribute for fresh pork had relatively stronger impact among consumers in Hai Duong than in Nam Sach.

Household income and location were the factors that significantly influenced Vietnamese consumers' willingness to pay for more hygienic pork (Table 11.4), where hygiene pertains to cleanliness of the slaughtering process and the area where the meat is sold. Specifically, consumers with higher incomes were more willing to pay a premium for more hygienic pork, with the probability rising by 5% for every 1% increase in household income. On the other hand, consumers from Hai Duong and Nam Sach were less willing to pay a premium for this attribute than consumers from Hanoi, with probabilities of 28% and 38%, respectively. It may be inferred that pork hygiene was relatively more important among consumers in Hai Duong than those in Nam Sach.

Willingness to pay for borax-free *gio*

Household income was a strong determinant of willingness to pay for *gio* that did not contain the food additive borax, as indicated by its highly significant positive coefficient (Table 11.5). More specifically, a 1% increase in household income would increase the probability of willingness to pay for borax-free *gio* by 13%, as indicated by the computed marginal effects. Male respondents were 12% more likely to be willing to pay for this attribute than their female counterparts; this is a curious result as it is usually the female buyers who are more concerned about food quality and safety issues than male buyers. Respondents who indicated that monosodium glutamate (MSG) food additive and product packaging were important in their buying decisions were also willing to pay for *gio* that did not contain borax. Choice of purchase outlet also influenced willingness to pay; consumers who never shopped in supermarkets and those who bought *gio* only once a year at supermarkets were more willing to pay for borax-free *gio*.

The factors that reduced willingness to pay for borax-free *gio* included household size, location and satisfaction with the presence of borax in *gio*. Specifically, the larger the household size, the less willing consumers were to pay for borax-free *gio*. This may be partly explained by the income constraint that households faced, in that larger households would incur higher food expenditures and hence their main concern would be to minimize costs of food purchases given a fixed level of income. Hence, willingness to pay a premium for certain product attributes would be lower because of the additional costs it would entail that would further add to total food expenditures. Specifically, a 1% increase in household size would decrease by 4.5% the probability that a household would be willing to pay more for borax-free *gio*.

Table 11.5. *Factors influencing willingness to pay for* gio *attributes*

Variable	Borax-free		MSG-free		Plastic packaging	
	Estimated coefficient	Marginal effect	Estimated coefficient	Marginal effect	Estimated coefficient	Marginal effect
Location dummy (Hai Duong = 1)	−0.458** (0.181)	−0.165** (0.066)	−0.279* (0.158)	−0.107* (0.060)	0.495*** (0.186)	0.121** (0.049)
Location dummy (Nam Sach = 1)	−0.726*** (0.218)	−0.263*** (0.080)	−1.217*** (0.212)	−0.424*** (0.061)		
Income of household	0.375*** (0.055)	0.131*** (0.018)	0.169*** (0.036)	0.066*** (0.014)	0.187*** (0.038)	0.042*** (0.009)
Sex of respondent (Male = 1)	0.386* (0.233)	0.122* (0.065)				
Household size	−0.129** (0.065)	−0.045** (0.022)				
Consumption of beef			0.639*** (0.212)	0.227*** (0.065)	0.598** (0.287)	0.105*** (0.036)
Consumption of buffalo			0.295* (0.176)	0.117* (0.070)		
Consumption of fish					−0.862* (0.445)	−0.273 (0.172)
Market outlet						
Buy gio annually at super-market	2.821** (1.119)	0.381*** (0.037)				
Never buy gio at supermarket	2.020* (1.088)	0.664*** (0.198)				
Buy gio weekly/monthly at open-air market			0.533* (0.282)	0.210* (0.108)	0.453* (0.240)	0.115* (0.067)
Satisfaction with attributes						
Satisfied with borax in gio	−0.259* (0.150)	−0.091* (0.053)				
Use of MSG is important	0.290** (0.147)	0.105* (0.054)	0.366*** (0.136)	0.139*** (0.050)		
Packaging is important	0.286** (0.132)	0.102** (0.048)				
No. of observations	598		600		600	
LR Chi²	219.78		181.38		107.09	
Pseudo R²	0.275		0.22		0.185	

Standard errors in parentheses. * Significant at 10%; ** significant at 5%; *** significant at 1%.
Source: Consumer survey, DURAS Project (2006).

Consumers in Hai Duong and Nam Sach were less willing to pay for borax-free *gio* than consumers in Hanoi. Specifically, consumers in Hai Duong and Nam Sach would, respectively, be 17% and 23% less likely to be willing to pay for borax-free *gio* relative to consumers in Hanoi. This suggests that Nam Sach was less of a potential market for borax-free *gio* than Hai Duong. Also, consumers who were at the time of the survey satisfied with the presence of borax in the *gio* they bought were less willing to pay for borax-free *gio*, suggesting that they were generally satisfied with the *gio* being sold on the market.

Willingness to pay for MSG-free *gio*

Household income also appeared to strongly influence willingness to pay for MSG-free *gio*; as income increased by 1%, the probability of willingness to pay for MSG-free *gio* increased by about 7% (Table 11.5). Purchase habits were also found to influence willingness to pay for MSG-free *gio*; specifically, consumers who bought *gio* weekly from open-air markets were 21% more likely to be willing to pay for this quality attribute of *gio*. Consumption of beef and buffalo meat were also shown to positively influence willingness to pay for MSG-free *gio*, with beef consumers having higher likelihood (23%) of willingness to pay for MSG-free *gio* than consumers of buffalo meat (12%). On the other hand, consumers from Hai Duong and Nam Sach were not willing to pay for MSG-free *gio*, suggesting that these regions would not be potentially lucrative markets for *gio* with this attribute. Note also that consumers from Nam Sach had a lower probability of willingness to pay for MSG-free *gio* (42%) than consumers in Hai Duong (11%) relative to consumers in Hanoi.

Willingness to pay for *gio* packaged in plastic bags only

Factors found to positively influence willingness to pay for *gio* packaged in plastic bags were household income, being located in Hai Duong, purchase of *gio* once a month in wet markets and consumption of beef (Table 11.5). Specifically, a 1% increase in household income increased the probability of willingness to pay for *gio* packaged in plastic bags by 4%. Consumers in Hai Duong were found to be 12% more willing to pay for *gio* packaged in plastic bags relative to consumers in Hanoi. Also, consumers who purchased *gio* once a month in open markets were more willing to pay for *gio* packaged in plastic bags only. While consumers of beef were 11% more likely to be willing to pay for *gio* packaged in plastic bags only, consumers of fish were 27% less likely to be willing to pay for this quality/safety attribute of *gio*. It is likely that consumers of fish rarely or never purchased *gio*, hence the observed lower willingness to pay for this product attribute.

Willingness to pay for *gio* packaged in banana leaves and plastic bags

Household income, satisfaction with the presence of MSG in *gio* and frequency of purchase of *gio* were found to positively influence consumers' willingness to pay for *gio* packaged in banana leaves and plastic bags. Specifically, a 1% rise in household income increased the likelihood of willingness to pay for *gio* with this type of packaging by about 9%. Consumers who indicated satisfaction with the presence of MSG in the *gio* they bought were 12% more likely to be willing to pay for *gio* packaged in banana leaves and plastic bags. Similarly, consumers who purchased *gio* once a year from wet markets were 11% more willing to pay

for this attribute of *gio*. On the other hand, consumers of buffalo meat were 12% less likely to be willing to pay more for *gio* packaged in banana leaves and plastic bags.

It should be noted that a separate model was run to estimate willingness to pay for *gio* packed in banana leaves only but no definite set of factors were obtained as the model was relatively unstable. As a result, no robust estimates could be reported.

Summary and conclusions

This study investigated the attributes influencing Vietnamese consumers' willingness to pay a premium for fresh and processed pork. Specific attributes of fresh pork included the following: low extramuscular fat; low intramuscular fat; high intramuscular fat; from pigs with exotic blood; from local breeds; from pigs reared with industrial feed; from pigs reared without industrial feed; nicer colour and better hygiene. These attributes were identified based on previous pork consumption studies and in consultation with consumers and market actors.

Household income was found to be a strong predictor of the likelihood of willingness to pay a premium for most of the above attributes, especially for pork with less visible (extramuscular) fat and less marbling or intramuscular fat (with the exception of pork with more intramuscular fat, from pigs reared with industrial feed and from pigs with exotic blood). Specifically, the results provide empirical evidence for the significantly strong effects of household income on willingness to pay for quality attributes of pork.

Level of education influenced the willingness to pay (and with a negative effect) of only one quality attribute: pork from pigs with exotic blood. Location was also found to significantly influence willingness to pay for most quality attributes of fresh pork except for pork from local pig breeds, pigs with exotic blood and pigs reared without industrial feed. Consumers in Hai Duong and Nam Sach were less likely than those in Hanoi to be willing to pay a premium for pork with less extramuscular fat, more or less intramuscular fat, nicer colour, better hygiene, or pork from pigs reared without industrial feed (although for the latter, the estimated coefficient was not statistically significant). Hence, urban consumers seemed to exhibit stronger preference and willingness to pay a premium for these attributes than their rural counterparts.

Choice of market outlet for fresh pork was also found to be a significant predictor of the likelihood of willingness to pay a premium for attributes such as pork with low extramuscular fat and that from exotic pig breeds. Consumers who bought a higher proportion of fresh pork at supermarkets were found to be more likely to pay a premium for fresh pork with low extramuscular (visible) fat. On the other hand, consumers who bought a higher proportion

of processed pork from supermarkets were found to be less likely to pay a premium for fresh pork from exotic pig breeds. Since breed is not a visible cue of pork quality, consumers may not be willing to pay a premium for this attribute unless they can be sure that they are indeed getting the quality they are paying for, or unless they can access credible certification or indicators for this attribute (exotic blood) via other cues such as reputation of the market outlet. For example, consumers who bought fresh pork at least once a year from supermarkets were also more likely to be willing to pay a premium for pork from exotic pig breeds. This is consistent with observations that the pork generally available in supermarkets is from exotic pigs or crossbreeds with higher proportion of exotic blood, given the nature of their supply procurement.

Consumption patterns were also important in determining the likelihood of willingness to pay a premium for quality attributes of fresh pork. Consumers who ate beef at least once a week were more likely to be willing to pay a premium for fresh pork with low extramuscular fat and from pigs reared without industrial feed. Consumers who ate beef at least once a month or buffalo meat at least once a year or who never consumed buffalo meat were more likely to be willing to pay a premium for fresh pork with low intramuscular fat. These consumers are more likely to be less avid meat eaters and hence may have been more conscious of the quality of meat they purchased, particularly the fat content. On the other hand, consumers who ate duck at least once a year were less likely to be willing to pay a premium for fresh pork with low intramuscular fat. Those who ate fish at least once a week or a month were less likely to be willing to pay a premium for fresh pork with more intramuscular fat but more likely to be willing to pay for fresh pork from local breed pigs. Fish eaters appeared to be more fastidious about visible fat in meat and about taste as evidenced by preference for pork from local pigs. Survey respondents and some key informants said that pork from local pigs tasted better than that from exotic pigs. Consumers who ate buffalo meat at least once a month were more likely to be willing to pay a premium for pork with low intramuscular fat.

Consumers who considered fat content to be an important factor in buying fresh pork were less likely to be willing to pay a premium for fresh pork with low extramuscular fat, suggesting an underlying preference for fatty meat. This is an interesting result and runs counter to the growing perception of increasing demand for lean meat and will be worthwhile investigating further. Consumers who indicated satisfaction with the colour of purchased fresh pork were also less likely to pay a premium for fresh pork from pigs reared without industrial feed. This may suggest that the effect of feeding system has no clear visible impact on the physical appearance of the pork that could affect consumer choice. Rather, colour is more likely to be associated with freshness, an attribute that appears to be highly desired by consumers in Vietnam, especially high income consumers and those who prefer to purchase meat from traditional or wet markets. On the other hand, consumers who indicated

satisfaction with the breed of pigs for fresh pork were less likely to pay a premium for fresh pork with low extramuscular fat, with more intramuscular fat, and from local pigs.

Household income was found to be a strong positive predictor of the amount of premium that consumers would be willing to pay for fresh pork with low extramuscular fat and nicer colour; the average consumer would be willing to pay about VND 1800 more for pork with nicer colour than that with less visible fat. This result indicates the relative importance that consumers place on the attribute that is associated with freshness (i.e. nicer colour) and is consistent with the prevailing dominant preference for fresh (newly slaughtered, warm) pork *vis-à-vis* frozen pork. Gender and education also had a strong influence on the amount of premium consumers were willing to pay for pork with low extramuscular fat (lower for male than female consumers) and education (higher for consumers with more education).

Location was also found to have a strong influence on willingness to pay for pork with various attributes. For instance, consumers from Hanoi were more willing to pay a higher premium for pork with nicer colour while those in Hai Duong were less willing to pay for pork with low extramuscular fat and better hygiene. This may suggest that consumers in Hanoi were more conscious about pork quality attributes than their Hai Duong counterparts, although the specific attributes desired were not similar in these two locations. Consumers who purchased pork at least once a week from supermarkets also exhibited a lower extent of willingness to pay a premium for pork with nicer colour. This suggests that consumers who have already shifted to shopping for food in modern outlets like supermarkets may be less likely to pay a premium on the attributes of pork associated with freshness (e.g. nicer colour) and that the driving force behind their consumption patterns may likely be convenience. This aspect needs further validation as it was not adequately captured in this study.

Consumers who ate chicken at least once a week or once a month were more likely to pay a higher premium for pork with low extramuscular fat, while non-consumers of fish were more likely to pay a higher premium for better pork hygiene.

As with fresh pork, household income was also found to strongly influence the likelihood of willingness to pay a premium for quality attributes in *gio*, namely, borax-free, MSG-free, packaged in plastic bags only, and packaged in both banana leaves and plastic bags. Household size and gender had an influence on willingness to pay for only one quality attribute of processed pork, namely, *gio* that did not contain borax. Consumers with large households were less likely to pay a premium for borax-free *gio*. Location also strongly influenced the likelihood of willingness to pay a premium for borax-free *gio* (lower likelihood for consumers in Hai Duong and Nam Sach), without MSG (lower likelihood for consumers in Nam Sach), and packaged in plastic bags only (higher likelihood for consumers in Hai

Duong). These results could inform production and marketing strategies for *gio* in each of these locations.

Consumer attitudes about specific attributes of *gio* were also strongly evident as predictors. For example, consumers who did not object to the presence of borax in *gio* were less likely to be willing to pay a premium for borax-free *gio*, while consumers who did not object to the presence of MSG in *gio* were more likely to be willing to pay a premium for *gio* packed in banana leaves and plastic bags. Consumer attitudes about use of MSG suggest that those who consider use of MSG to be important are more likely to be willing to pay a premium for borax- and MSG-free *gio*, while those who consider packaging to be important are more likely to be willing to pay a premium for borax-free *gio*.

Purchase patterns were also shown to strongly influence the likelihood of willingness to pay a premium for quality attributes of processed pork. Specifically, consumers who bought *gio* from supermarkets at least once a year were more likely to pay a premium for borax-free *gio*. On the other hand, those who preferred to purchase pork from open-air or wet markets were more likely to be willing to pay a premium for borax- or MSG-free *gio* and for *gio* packed either in plastic bags only or in both banana leaves and plastic bags.

Consumption patterns of other meat products also had a strong influence on the likelihood of willingness to pay for specific attributes of *gio*. Specifically, consumers of beef had a higher likelihood of willingness to pay for MSG-free *gio* and *gio* packaged in plastic bags only. Consumers of buffalo meat, on the other hand, were more likely to be willing to pay for MSG-free *gio* but less likely to be willing to pay for *gio* packaged in both banana leaves and plastic bags. Consumers of fish were less likely to be willing to pay for *gio* packaged in plastic bags only. Since consumption patterns of other types of meats are likely to be correlated with income (beef consumption with higher income, for example), these results suggest that the type of packaging of *gio* matters when targeting marketing strategies to consumers of different income levels.

In terms of extent of willingness to pay a premium, household income was shown to be a strong predictor of the amount of premium that consumers were willing to pay. For example, higher income consumers were more likely to pay a higher premium for borax-free *gio* and for *gio* packaged in plastic bags only or in both banana leaves and plastic bags. The effect of household income on the amount of premium that an average *gio* consumer was likely to pay was relatively stronger for the attribute 'packaged in plastic bags only' compared to other packaging alternatives.

Location variables had contrasting effects on the amount of premium that consumers would be willing to pay for quality attributes in *gio*. For example, consumers in Nam Sach and Hai

Duong were less likely to pay a premium for MSG-free *gio* relative to consumers in Hanoi. On the other hand, consumers in Hai Duong were more likely to pay a higher premium for *gio* packaged in plastic bags only relative to consumers in Hanoi. These results are useful indicators of production and marketing strategies that can be implemented to improve consumer acceptance of *gio* in these locations.

Consumer attitudes about the presence of borax and MSG in *gio* and the type of packaging were also found to influence the amount of premium that consumers would be willing to pay for specific quality attributes of *gio*. For example, consumers who did not object to the presence of borax in *gio* were likely to pay a lower premium for borax-free *gio*, while those who did not object to the presence of MSG were likely to pay a higher premium for *gio* packaged in both banana leaves and plastic bags. Meanwhile, consumers who felt that use of MSG and packaging were important for *gio* were more likely to pay a higher premium for borax-free *gio*.

Purchase patterns and choice of market outlet, specifically consumers who purchased *gio* in open air or wet markets, were found to be significant determinants of the extent of willingness to pay for *gio* packaged in both banana leaves and plastic bags.

In addition, consumers of beef were found to be more likely to pay a higher premium for borax- and MSG-free *gio* and *gio* packaged in plastic bags, while consumers of buffalo were likely to pay a lower premium for *gio* packaged in both banana leaves and plastic bags. Meanwhile, consumers of chicken were likely to pay a lower premium for borax-free *gio*, unlike consumers of fish who were likely to pay a higher premium for the same. However, they were likely to pay a lower premium for *gio* packaged in plastic bags only.

Implications of results

The results of this study provide empirical support to validate some stylized facts about consumer preferences for specific quality and safety attributes of fresh and processed pork. In general, socio-demographic characteristics of consumers influence their preference for specific product attributes and the nature of their demand for such attributes. Household income and location are strong determinants of preferences and hence should be given due consideration when designing production and marketing strategies for fresh and processed pork. Higher household income is shown to be a strong factor for increasing demand for quality attributes such as low fat content, better hygiene and nicer colour, and for traditional attributes such as pork from local pigs or those reared without industrial feed. These findings indicate the existence of preference among higher income consumers for traditional attributes that are usually associated with products from niche markets, e.g. for very specific product attributes that are neither widely available nor demanded by the

average consumer. Higher level of education is also associated with lower likelihood of willingness to pay a premium for pork from pigs with more exotic blood. Specifically, the results suggest that there is a group of relatively higher income, better-educated consumers in Hanoi who demand hygienic, fresh and low-fat pork. Similarly, these consumers also prefer pork with local flavour/taste (e.g. from local pigs reared without industrial feed) that may be met by producing pork from crossbreeds with high local blood content and reared more on traditional feeds (e.g. grasses and local or mixed feeds) and less on industrially processed feed. The results also seem to suggest that consumers are likely to pay a premium for less visible fat (low extramuscular fat), although this need not necessarily suggest preference for lean meat (i.e. exotic pigs) as extramuscular fat in pork from crossbreeds can be trimmed by sellers.

The income effect also seems to be evident in the effect of consumption of other meat products and fish on preference for pork attributes. For example, consumers of beef, fish and duck meat—which are all relatively more expensive than pork—also exhibited preferences for low-fat pork and attributes associated with traditional pig feeding systems.

There are indications that lean pork (i.e. from exotic breed pigs) is preferred by consumers who purchase pork from supermarkets and they are likely to pay a premium for this attribute. Again, this behaviour is highly associated with income and being located in an urban area such as Hanoi, and has implications on marketing strategies for lean pork.

For processed pork like *gio*, income is a strong determinant of willingness to pay a premium for safety attributes such as absence of borax and MSG and more hygienic packaging. These attributes were better appreciated and valued by consumers in Hanoi than those in Hai Duong and Nam Sach so a price premium for such attributes could be potentially achieved when sold in Hanoi. On the other hand, packaging *gio* in plastic bags would be preferable for consumers in Hai Duong but not in Nam Sach.

Price premium for borax- or MSG-free *gio* is more likely to be paid by consumers who buy pork in supermarkets than those who shop in other market outlets. Consumers who frequent open-air or wet markets will likely pay a premium for MSG-free *gio* if it is also packaged in plastic bags or in a combination of banana leaves and plastic bags.

These findings are recommended to be used as indicators of potential strategies for designing production and marketing options that can be piloted by a small group of collaborating households. There is a need to identify target consumers given the differential preference for various pork attributes exhibited by different consumer income groups. Understanding these differences could lead to better targeting of interventions that can be prescribed on the ground. More importantly, the potential price premium that consumers may be willing

to pay for specific quality and safety attributes can only be realized when consumers trust the product. This indicates a need for producers and suppliers to achieve credibility and reputation for delivering products with these stated attributes.

References

Carriquiry M and Babcock B. 2005. *Managing quality under heterogeneous consumer demand and quality.* Working Paper 05-WP 410. Centre for Agricultural and Rural Development, Iowa State University, Iowa, USA. 30 pp.

Darby MR and Karni E. 1973. Free competition and the optimal amount of fraud. *Journal of Law and Economics* 16(1):67–88.

Figuié M. 2006. Trip report for Nam Sach. Mimeo.

Figuié M and Dao TA. 2002. *Food consumption in Vietnam: Food markets, food habits, diversity and trends.* MALICA working paper. CIRAD, Hanoi, Vietnam. 18 pp.

Ginhoux V. 2001. *Etude de la sensibilité des consommateurs urbains de viande porcine.* Programme d'Appui à l'Organisation de la Production Agricole. Programme Fleuve Rouge. GRET, VASI, VSF, CIRAD, Hanoi, Vietnam.

Greene W. 1997. *Econometric analysis.* 3rd edition. Prentice-Hall, Inc. USA. 1075 pp.

Humphrey J. 2005. Shaping value chains for development: Global value chains in agribusiness. Paper written for the Deutsche Gesellschaft fur Technische Zusammenarbeit (GTZ).

Jensen H. 2006. Consumer issues and demand. *Choices* 21(3):165–169.

King RP and Venturini L. 2005. Demand for quality drives changes in food supply chains. In: Regmi A and Gelhar M (eds), *New directions in global food markets.* Agriculture Information Bulletin No. 794. US Department of Agriculture, Economic Research Service, Washington, DC, USA.

Luan NN, Figuié M, Lapar ML, Pedregal VD, Quang HV and Binh VT. 2006. Consumption demand of pig meat in the Red River Delta of Vietnam. Report prepared for the DURAS project 'Improving the pig and pig meat marketing chain to enable small producers to serve consumer needs in Vietnam and Cambodia'. Mimeo.

Maddala G. 1983. *Limited-dependent and qualitative variables in econometrics.* Econometric Society Monographs No. 3. Cambridge University Press, UK. 401 pp.

Miller G and Unnevehr L. 2001. Characteristics of consumers demanding and their willingness to pay for certified safer pork. *Journal of Agribusiness* 19(2):101–119.

Mojduszka EM and Caswell JA. 2000. A test of nutritional quality signalling in food markets prior to implementation of mandatory labelling. *American Journal of Agricultural Economics* 82(2):298–309.

Moustier P. 2006. Marketing of Nam Sach quality pigs. Trip report for the DURAS project, 21–23.

Nelson P. 1970. Information and consumer behaviour. *Journal of Political Economy* 78(2):311–329.

Nelson P. 1974. Advertising as information. *Journal of Political Economy* 82(4):729–754.

Pedregal VD, Luan NN, Figuié M and Moustier P. 2009. Familiarity with consumer expectations to support smallholders: Demand for quality pork in Vietnam. In this volume.

Reardon T, Codron J-M, Busch L, Bingen J and Harris C. 2001. Global change in agri-food grades and standards: Agribusiness strategic responses in developing countries. *International Food and Agribusiness Management Review* 2(3/4):421–435.

Regmi A and Gelhar M. (eds). 2005. *New directions in global food markets.* Agriculture Information Bulletin No. 794. US Department of Agriculture, Economic Research Service, Washington, DC, USA.

Sanders D, Moon W, Kuethe T, Beck R and Young A. 2004. Assessing the potential for value-added pork in Illinois. Final report prepared for the Illinois Pork Producers Association, AgriFIRST and Southern Illinois University College of Agricultural Sciences. Southern Illinois University, USA. 78 pp.

Tung DX. 2006. Assessment of demand and preferences for pork in Vietnam. Mimeo.

World Bank. 2006. Vietnam food safety and agricultural health action plan. Report No. 35231 VN. East Asia and Pacific Region, Agriculture and Rural Development Department. The World Bank, Washington, DC, USA. Mimeo.

Chapter 12   Consumer demand for fresh and processed pork in Cambodia

Khieu Borin,[1] Ma. Lucila A Lapar,[2] Nguyen Thi Duong Nga,[3] Mohammad A Jabbar[4] and Seng Sokerya[5]

1. khieu_borin@celagrid.org; director of the Centre for Livestock and Agricultural Development, Phnom Penh, Cambodia

2. l.lapar@cgiar.org; research scientist at the International Livestock Research Institute (ILRI), Hanoi, Vietnam

3. ngantd2004@hotmail.com; associate professor at the Faculty of Economics and Rural Development, Hanoi Agricultural University, Hanoi, Vietnam

4. mjabbar2@gmail.com; was a senior agricultural economist at ILRI, Addis Ababa, Ethiopia and is currently a consultant agricultural economist in Dhaka, Bangladesh

5. sengsokerya@yahoo.com; researcher at the Centre for Livestock and Agricultural Development, Phnom Penh, Cambodia

Abstract

This paper discusses empirical findings and implications from a survey of pork consumers in Cambodia, specifically on consumption patterns and preference ratings for different attributes of pork. The survey results highlight the strong preference for fresh pork, pork from local breeds, low fat content and visible certification of carcass by a recognized authority. Indicators that are correlated with freshness, such as red colour and presence of fresh blood on the meat, were also preferred. The most important safety concern with fresh pork was whether the animal was disease-free and this concern was stronger in urban compared to rural areas. Hormone and antibiotic residues were not yet major concerns as these substances are hardly used in traditional scavenging production systems that are still predominant in Cambodia, and the commercial production system is still fairly small. On the other hand, although respondents did not raise safety concerns about chemical substances such as hormones, antibiotics and growth promoters used in pig production—particularly from concentrate feed—this may suggest low levels of awareness among consumers about these substances and therefore a need to increase awareness by providing adequate public information and education about these emerging issues in food safety. While most consumers indicated willingness to pay a premium for pork that has a guarantee of safety and high quality, a significant share were still unwilling to do so. These findings may be useful to various stakeholders, including policymakers, to inform strategies for improving the competitiveness of smallholder pig producers in the light of changing demand for pork products.

Key words: consumer preference, demand, pork, Cambodia

_____

Background and objectives

Smallholders in Cambodia hold over 90% of livestock and the mean holding of livestock in the rural areas has been reported to be 1.6 large ruminants, 0.96 pigs and 13 head of poultry per household, mostly managed in scavenging or semi-scavenging systems (European Commission 2003). Besides draught power provided by large ruminants, there is a considerable contribution from pigs and poultry to farmers' livelihoods and food security. Most farmers raise local breeds of animals and birds although small- and medium-scale commercial farms near cities and towns keep exotic or improved breeds in order to meet the increasing demand for meat and eggs of the fast growing and increasingly affluent urban populations.

Livestock and livestock products have long been an essential pathway for income generation and livelihoods for the poor. In 2002, livestock contributed about 7.6% of Cambodia's Gross Domestic Product. Income and population growth has led to high demand for meat. In addition to other types of meat, the annual demand for pork has significantly increased from 5.2 t in 1980 to 110 t in 2002 (FAO 2005). FAO (1997) estimated that the annual meat consumption in Cambodia in 2010 will be 12.4 kg per person, i.e. 3.3 kg of ruminant meat and 9.1 kg of non-ruminant meat. However, growth of the livestock sector will depend on its propensity to commercialize in response to consumer demand for increased volume of output and improved quality. Knowledge of demand patterns is very weak as few empirical studies have been conducted in Cambodia on consumer demand for food in general and livestock products in particular. In order to fill this gap, a survey was conducted on consumer demand for livestock products and the market outlets that consumers use to buy those products. This paper focuses on the analysis of demand for pork with respect to various attributes and market outlets.

The survey was conducted in Khan Chamcarmon in Phnom Penh city (representing urban areas) and Daun Keo district in Takeo province (representing rural areas). Four villages were selected purposively to cater for variations in population densities, income classes and market accessibility. Ninety-seven urban households and 81 rural households were randomly sampled from the selected villages for detailed survey. In addition, 10 urban restaurants, 9 rural restaurants and 5 processors mainly located in urban and peri-urban areas were also selected from the study areas. The detailed survey was conducted using a pre-tested, semi-structured questionnaire.

Results and discussion

Eighty-eight percent of urban and 81% of rural respondents were women, who were also the main household food managers and income earners. Pig production was the main

occupation of 30% of the sampled rural households while farming and other livestock production were the main occupations of 19% of rural households. The rest of the rural households were engaged in various other occupations. In urban areas, government service, private-sector employment and trading were the major occupations. Most households (over 90%) in both urban and rural areas ate pork, chicken, duck and beef. A quarter of sampled urban households ate goat meat while a similar proportion of rural households ate buffalo meat (Table 12.1).

Table 12.1. *Household consumption and mean preference rating of different types of meat, by location*

| Type of meat | Urban areas | | Rural areas | |
	% of households	Preference rating	% of households	Preference rating
Pig	99	9.0 (0.2)	100	8.7 (0.2)
Chicken	100	5.1 (0.2)	98	5.4 (0.3)
Duck	91	3.1 (0.20	93	4.2 (0.2)
Cow	99	5.0 (0.2)	86	4.2 (0.3)
Buffalo	8	2.3 (0.6)	21	3.1 (0.6)
Goat	26	1.4 (1.4)	7	2.0 (0.9)

Preference rating on a scale of zero (no preference) to 10 (highest preference). Standard errors in parentheses. Source: Field survey.

In terms of preference rating of meat consumed, pork had the highest rating among both urban and rural consumers (Table 12.1). Rating was done on a scale of 1 (lowest preference) to 10 (highest preference). Fresh pork was usually consumed but processed pork products also accounted for a good share of consumption, especially in urban areas. Therefore, the remainder of this paper is devoted to consumption patterns and preference ratings for different attributes of pork.

Urban households bought fresh pork more frequently than rural households. In both urban and rural areas, festivals were peak consumption periods for fresh pork though about a quarter of urban consumers consumed pork year-round rather than at specific seasons or during festivals (Table 12.2).

Rating of quality attributes of pork

The quality of pork may be judged on the basis of a number of criteria and related indicators including breed of the animal, production system and physical characteristics of the carcass. Consumers may give varying degrees of weight to one or more of these criteria when judging quality and expressing preference. Respondents were asked to rate fresh pork on the basis of the breed, type, production system and feeding system of the animal; fat content, colour and appearance of the meat; and whether the carcass was certified by an appropriate authority.

The attributes were rated on a scale of zero (no preference) to 10 (highest preference). The results are summarized in Table 12.3.

Table 12.2. *Household purchase of and seasonal demand for fresh pork, by location*

	Urban households (%)	Rural households (%)
Frequency of weekly purchase of fresh pork		
Once	2	1
Twice	10	24
Every two days	42	25
Daily	35	28
As necessary	10	22
Season of highest demand for fresh pork		
Rainy season	3	10
Dry season	9	25
Festivals	64	60
None	24	5

Source: Field survey.

Table 12.3. *Mean preference rating of quality attributes of fresh pork, by location*

Quality attributes	Urban areas	Rural areas
Breed		
Local	9.1 (0.1)	8.9 (0.2)
Improved/exotic	4.5 (0.2)	5.1 (0.3)
Cross	6.4 (0.2)	6.3 (0.2)
Sex		
Male (uncastrated)	3.5 (0.2)	3.0 (0.2)
Male (castrated)	8.8 (0.2)	9.3 (0.1)
Female	5.4 (0.3)	6.7 (0.2)
Type of pig		
Sow	4.7 (0.2)	7.4 (0.2)
Boar	3.2 (0.2)	5.6 (0.4)
Finished (fattened) pig	9.4 (0.1)	9.2 (0.1)
Piglet	5.1 (0.2)	7.6 (0.3)
Production system		
Scavenging	8.0 (0.4)	8.8 (0.3)
Confined	8.2 (0.4)	7.8 (0.4)
Feeding		
Home-made/local	8.7 (0.2)	8.2 (0.3)
Concentrate	6.2 (0.3)	7.0 (0.2)
Mixed	7.2 (0.4)	7.9 (0.4)
Fat content		
Low	8.5 (0.2)	9.0 (0.2)
Medium	6.5 (0.2)	6.7 (0.1)
High	4.0 (0.2)	4.4 (0.2)

Quality attributes	Urban areas	Rural areas
Colour		
Red	8.8 (0.2)	9.3 (0.2)
Pale	4.8 (0.2)	4.9 (0.2)
Appearance		
Fresh/presence of blood	9.1 (0.2)	9.4 (0.2)
Dry	5.5 (0.2)	6.2 (0.2)
Watery	4.5 (0.2)	4.7 (0.2)
Certified		
Yes	9.0 (0.2)	9.4 (0.2)
No	4.7 (0.2)	5.3 (0.2)

Preference rating on a scale of 0 (no preference) to 10 (highest preference). Standard errors in parentheses. Source: Field survey.

Local breeds were most preferred in urban and rural areas followed by crossbreeds and improved or exotic breeds. Castrated male pigs were most preferred followed by females and uncastrated males. In both rural and urban areas, meat from finished (fattened) pigs was most preferred followed by meat from piglets, sows and boars (in that order). However, urban consumers rated meat from boars and piglets much lower than did their rural counterparts. Respondents in rural and urban areas were basically indifferent to animals raised under scavenging vs. confined production systems but showed slightly higher preference for animals fed on home-made or local feed compared to mixed or concentrate feed. In terms of carcass characteristics, both urban and rural consumers showed higher preference for fresh/blood-soaked, low-fat meat that had been certified by an appropriate authority to be disease-free and fit for human consumption.

In high income countries, carcass cuts are differentiated and priced differently based on consumer choice and preferences. In developing countries, however, raw meat is rarely—if at all—officially graded or labelled based on objective criteria, although some butchers may sell different cuts of meat depending on consumer preference. In order to find out if such quality differentiation existed in the Cambodian market for fresh pork, respondents were asked to rate their preferences for different cuts of fresh pork and different types of processed pork based on a number of suggested quality and safety criteria such as taste, nutritive value, hygiene, packaging, shelf life and price. The results are summarized in Table 12.4.

Concerns about quality and safety of fresh pork and processed pork

Although aspects of quality and safety criteria were considered when asking consumers to rate their preferences for different cuts and types of pork, respondents were also asked more directly if they had food quality and safety concerns about fresh and processed pork. Ninety-six percent of urban and 89% of rural consumers said they had concerns about quality of

fresh pork, while 90% of urban and 74% of rural respondents said they had concerns about the quality of processed pork (Table 12.5).

Table 12.4. *Mean reference rating of different cuts of fresh pork and types of processed pork, by location*

Type of cut/product	Urban areas	Rural areas
Fresh pork		
Shoulder (ham)	9.0 (0.1)	8.1 (0.1)
Leg (ham)	8.3 (0.1)	9.3 (0.1)
Loin	8.9 (0.1)	9.1 (0.1)
Ribs	8.1 (0.1)	7.4 (0.2)
Backbone	6.1 (0.2)	5.8 (0.2)
Head	4.2 (0.2)	4.0 (0.2)
Bacon	5.4 (0.2)	5.4 (0.2)
Intestinal tract	5.7 (0.2)	5.7 (0.2)
Processed pork		
Sausage	7.0 (0.2)	7.1 (0.4)
Meat ball	6.3 (0.3)	6.9 (0.3)
Pâté	5.5 (0.3)	6.7 (0.3)
Dried meat	7.9 (0.3)	9.0 (0.2)
Frankfurters	6.7 (0.9)	8.0 (0.8)
Pork flakes	7.5 (0.3)	8.3 (0.4)

Preference rating on a scale of zero (no preference) to 10 (highest preference). Standard errors in parentheses. Source: Field survey.

In the case of fresh pork, the most important quality concern was fat content (more important in rural areas) though it was not clear if high or low fat content was the concern. Other concerns were freshness (more important in urban areas) and taste (equally important in both locations). Other concerns of minor importance were the colour, appearance and cleanliness of cuts.

As was the case for fresh pork, the most important quality concern regarding processed pork products was fat content, and this was more important in rural than in urban areas. Other concerns were taste, smell, processing technique, appearance, colour and packaging, some of which were slightly more important in urban areas and others in rural areas.

Respondents were also asked about the extent to which they would be willing to pay a premium for a guaranteed-quality product. Nearly a quarter of the respondents who expressed concern about quality were unwilling to pay any premium for a quality guarantee while about 60% were willing to pay 10% more on the existing price, about 15% were willing to pay 25% more and only 2% were willing to pay 50% more.

Table 12.5. *Consumer concerns about the quality of fresh and processed pork, by location*

	Urban consumers (%)	Rural consumers (%)
Concerned about quality of fresh pork?		
% responding 'yes'	96	89
If yes, what is the most important concern?		
Fat content	45	54
Freshness	24	15
Appearance	6	7
Taste	9	10
Colour	6	4
Smell	9	8
Cleanliness of meat cuts/other	1	1
Concerned about quality of processed pork?		
% responding 'yes'	90	74
If yes, what is the most important concern?		
Fat content	28	40
Packaging	2	8
Overall appearance	16	5
Taste	25	20
Colour	5	8
Smell	14	12
Processing technique and ingredients used	10	5
If yes for quality concerns, willing to pay premium for pork with quality guarantee?		
50% more than current price	2	2
25% more than current price	14	15
10% more than current price	61	58
Not willing to pay more	23	25

Source: Field survey.

With regard to food safety, 97% of urban respondents and 95% of rural respondents reported having concerns about the safety of fresh pork while 98% of urban respondents and 78% of rural respondents were concerned about the safety of processed pork (Table 12.6).

In the case of fresh pork, consumers in both rural and urban areas generally preferred main cuts to organs, and among the main cuts, the shoulder, leg and loin were more preferred than ribs and the backbone. As regards the preference rating of different types of processed pork products, there was little variation between consumers in urban and rural areas.

In the case of fresh pork, the most important safety concern was whether the animal was disease-free and this factor was of greater concern to urban than rural consumers (Table 12.6). Other important safety concerns were levels of hygiene in the markets and slaughterhouses. Residues of hormones and antibiotics in pork were not recorded as major

concerns because these substances are hardly used in the predominant traditional scavenging pig production systems and commercial pig production is not widespread.

Table 12.6. *Consumer concerns about the safety of fresh and processed pork, by location*

	Urban consumers (%)	Rural consumers (%)
Concerned about safety of fresh pork?		
% responding 'yes'	97	95.1
If yes, what is the major concern?		
Hygiene in slaughtering	8	12
Hygiene in market outlet	10	16
Disease-free or not	81	69
Hormone-free or not	–	3
Antibiotic-free or not	1	1
Concerned about safety of processed pork?		
% responding 'yes'	98	78
If yes, what is the major concern?		
Packaging	7	6
Hygiene in market outlet	12	22
Free of chemical additives or not	65	44
Disease-free or not	15	25
Antibiotic-free or not	1	–
Shelf life	–	2
If yes for safety concerns, willing to pay premium for pork with safety guarantee?		
50% more than current price	2	1
25% more than current price	17	16
10% more than current price	63	74
Not willing to pay more	18	9

Source: Field survey.

For processed pork, the most important safety concern was whether the products were free from chemical additives and this concern was of greater importance among urban than rural consumers. Other important safety concerns included the level of hygiene in the market place and whether the pork products were derived from disease-free pigs; both these concerns were of greater significance among rural consumers.

Among consumers reporting concerns about the safety of pork, 18% of urban respondents and 9% of rural respondents were not willing to pay a premium for guaranteed-safety pork products. However, 63% of urban and 74% of rural respondents were willing to pay up to 10% above the existing price, while 16% in both urban and rural areas were willing to pay 25% more for guaranteed safety.

Discussion and implications of results

In general, consumers preferred fresh pork from local breeds of pigs raised on diets based on local feed resources. Consumers also indicated preference for several other attributes of pork representing quality and safety. In the absence of official grades and standards for pork, these consumer-preferred indicators should serve as good guides for producers and market agents about the types of products to be produced and supplied.

Only a few types of processed pork were available and a limited quantity was sold in the markets. Consumers generally had a negative perception of processed pork products, viewing them as the leftovers from poor processing techniques that resulted in low-quality products. Hence, if pork processing is to be targeted as an option for value-addition to improve livelihoods of smallholder farmers, appropriate training on pork processing will have to be introduced as a priority strategy for rural development and income generation. Subsequently, improved processing techniques might help to build consumers' trust in locally processed pork products.

Consumers in both urban and rural areas did not indicate much concern about residues of substances such as hormones, antibiotics and growth promoters in pork. This lack of concern may suggest low levels of consumer awareness about the potential risks associated with these chemical residues, and hence the need to provide adequate public information and education about these emerging food safety issues.

This was the first quantitative and qualitative survey of consumer demand and market outlet choice for fresh and processed pork in rural and urban Cambodia which documented significant information about consumption patterns and consumer preferences. Hence, this body of information may be useful to various stakeholders, including policymakers, to inform strategies for improving the competitiveness of smallholder pig producers in the light of changing demand for pork products. Specifically, information on consumer preferences for product quality attributes and consumer concerns about the quality and safety of pork may assist producers to raise pigs according to the demand, thereby enhancing livelihood opportunities from pig production and marketing.

References

European Commission. 2003. *Support to veterinary services in Cambodia*. Report of the feasibility study executed by RWA International.

FAO (Food and Agriculture Organization of the United Nations). 1997. The estimation of meat consumption in Cambodia 2010. Unpublished report. FAO, Rome, Italy.

FAO (Food and Agriculture Organization of the United Nations). 2005. *Livestock sector brief.* Livestock information, sector analysis and policy branch, AGAL. FAO, Rome, Italy. pp 1–21.