International Journal of Consumer Studies

International Journal of Consumer Studies ISSN 1470-6423

Consumer willingness to pay for food safety in Tanzania: an incentive-aligned conjoint analysis

Roselyne Alphonce[1,2] and Frode Alfnes[1]

[1]Department of Economics and Resource Management, Norwegian University of Life Sciences, Ås, Norway
[2]Department of Agricultural Economics and Agribusiness, Sokoine University of Agriculture, Morogoro, Tanzania

Keywords
Conjoint analysis, food safety, incentive-compatible method, organic, tomatoes, Tanzania.

Correspondence
Frode Alfnes, Department of Economics and Resource Management, Norwegian University of Life Sciences, PO Box 5003, N-1432 Ås, Norway.
E-mail: frode.alfnes@umb.no

doi: 10.1111/j.1470-6431.2011.01067.x

Abstract

In this paper, we present results from a consumer experiment in Tanzania focusing on food safety. We elicit consumers' willingness to pay (WTP) a premium for tomatoes that have been inspected by health officials to meet the standards set by the Tanzania Bureau of Standards. We also elicit consumers' WTP for tomato attributes that can be associated with different food safety standards: conventional vs. organically produced and various origins. Two hundred sixty-nine urban consumers from Morogoro, Tanzania took part in the experiment where they evaluated tomatoes using the Becker–deGroot–Marschak mechanism. The results show that on average, consumers in Tanzania are willing to pay a premium for inspected and organically produced tomatoes. Consumers have a strong preference for tomatoes produced in Tanzania and do not discount tomatoes produced in areas associated with poor agricultural practices. However, consumers do significantly discount tomatoes imported from South Africa.

Introduction

As African economies grow, demand for food quality is likely to increase. In Tanzania, for example, the income per capita[1] has more than doubled from 2000 (US$ 732) to 2011 (US$ 1491) and is predicted to continue to rise in the coming years (International Monetary Fund, 2011). One important factor of food quality is food safety. In this paper, we present the results of an experiment conducted to investigate how urban consumers evaluate attributes that can be associated with food safety.

Residues of pesticides or heavy metals are not detectable by ordinary consumers, either before or after consumption. Sellers of food products are unlikely to provide information about these food hazards. Hence, consumers concerned about these hazards have to rely on credence attributes like food being inspected to meet certain standards or organically produced, or having a geographical identity associated with good agricultural practices.

Until recent years, vegetables like tomatoes, spinach, cabbage and amaranthus were perceived to be organically grown in Tanzania. However, due to the rise in demand, vegetable production has shifted from a subsistence level to commercial production. Many farmers have intensified production and have been tempted to use poor agricultural practices, and even produce product in areas highly susceptible to heavy metals (Bahemuka and Mubofu, 1999; Ndengerio-Ndossi and Cram, 2005; Ngowi *et al*., 2007; Shemdoe, 2010).

Due to the rise in awareness of these poor practices, there has been a rise in government and consumer concerns that unhealthy foods could be found in markets. On March 15, 2011, *The Guardian* reported the Tanzania Minister of Trade's concerns for strengthening food safety and quality control systems, through promoting good agricultural and animal husbandry practices (Andrew, 2011). Recently, there has been a government debate in Tanzania to lift the ban on dichlorodiphenyltrichloroethane (DDT) for use in controlling malaria. This has raised consumer concerns for food safety issues. For example, Ndengerio-Ndossi and Cram (2005) found the presence of pp-DDT in many samples of food at the table-ready stage, which indicated there was already a use of DDT in agricultural production despite the ban.

In this paper, we use an incentive-aligned conjoint analysis to investigate how consumers value credence attributes that can be associated with food safety. The outline of the remaining paper is as follows. First is a short literature review of consumer studies on food safety. Second is the description of the experimental design and methods. Third is the description of the data. Fourth is the description of the econometric model used to analyse the data. Fifth comes the results, and last we conclude.

[1]The International Monetary Fund's estimates for gross domestic product based on purchasing power parity per capita.

Consumer studies on food safety

There has been significant research regarding consumer knowledge, perception, attitudes, preferences, and willingness to pay (WTP) for credence attributes associated with food safety in the US and Europe. In a study of food values among US consumers, Lusk and Briggeman (2009) found that food safety was the most important food value, followed by nutrition, taste and price. Loureiro and Umberger (2007) found that the United States Department of Agriculture food safety inspection label, steak tenderness label and traceability were the most important credence attributes for beef. Mørkbak *et al*. (2011) showed that Danish consumers were willing to pay a premium for food safety when they were introduced to products with additional food safety characteristics. A study by Loureiro and Umberger (2003) found that US consumers were willing to pay a premium for steaks labelled 'Guaranteed USA: Born and raised in the US'. The reason for preference for the country of origin label included food safety concerns, desire to support their local producers and belief that US beef was of higher quality.

Most studies done in Europe and the US report education, gender and income to have a significant effect on the evaluation of credence attributes that can be associated with food safety. For example, Byrne *et al*. (1992) found women and highly educated consumers to have a higher probability of purchasing organic foods. Loureiro and Umberger (2003) found higher concern on food safety among female and high-income shoppers. Wang and Sun (2003) found younger consumers with smaller households and larger incomes were more likely to purchase organic produce. And Smith *et al*. (2009) found that education and income influence the probability of a person purchasing fresh organic produce.

In developing countries, very few consumer studies focusing on preference and WTP for food safety have been conducted. A closely related study is Lagarkvist *et al*. (2011), who study consumer WTP for safer leafy vegetables in Nairobi. They analysed consumer WTP across four major market outlets (open air, roadside, supermarket and specialty shops) and reported WTP for safer vegetables to be market-specific and multifaceted. Trust and perceived risks were identified as the most important factors influencing WTP where income played only a subordinate role. Another related consumer study done in rural China found households consume more higher-quality foods as their incomes increased (Yu and Abler, 2009).

Other consumer studies related to food safety in developing countries include studies on biotechnology products conducted in Tanzania, Uganda, Kenya and the Philippines. In Tanzania, a qualitative study on genetic modification (GM) technology found very poor knowledge, understanding and awareness of the potential risks and benefits of the technology among farmers. However, the study found a high potential for demand and use of GM products in Tanzania (Lewis *et al*., 2010). Kikulwe *et al*. (2011) studied consumer perceptions towards GM bananas in Uganda and found that consumers were willing to buy GM bananas if they had the same price as conventional bananas, but had better quality (more nutritious, tasted better, or required fewer pesticides). They found income and education negatively influence attitudes to GM bananas, but no gender effect. A similar study on consumer awareness and perception of GM maize meal in Kenya found high-income consumers to have the lowest benefit perception and highest environmental risk perception on GM foods. However, more than 68% of the respondents were willing to buy GM maize meal at the same price as their favourite maize meal brand (Kimenju and De Groote, 2008). Depositario *et al*. (2009) found gender and age to have a significant effect on WTP for GM rice among Filipino consumers, while education, income and awareness had a negative though insignificant effect on WTP for GM rice.

Experimental design and methods

We conducted a conjoint analysis with the incentive-compatible Becker–DeGroot–Marschak (BDM) mechanism (Becker *et al*., 1964). Conjoint analysis is a widely applied marketing research method used to investigate consumer preferences for a large number of product attributes (Wittink *et al*., 1994). Conjoint analysis has been widely used both with rating-based conjoint methods (see, for example, Otter *et al*., 2004) and choice-based conjoint methods (see, for example, Vermeulen *et al*., 2008). Conjoint studies have been widely done in developed countries, but until recently, there have been very few studies reported from developing countries.

Our design departs from that of other rating- and choice-based conjoint studies in that it uses a well-tested incentive-compatible method from the non-market valuation literature to rate products. Whereas most rating-based conjoint studies ask the respondents to rate their liking for products on a scale (Otter *et al*., 2004), our respondents showed their liking by the amount of money they were willing to pay for the product in the BDM mechanism.

In the BDM, the subject formulates a bid. The bid is compared with a price determined by a random number generator. If the subject's bid is greater than the price, he or she pays the price and receives the item being auctioned. If the subject's bid is lower than the price, he or she pays nothing and receives nothing. The optimal strategy in the BDM is to submit a bid that is equal to your maximum WTP, and thereby reveal your preferences. The incentive-compatible BDM mechanism has been widely used in non-market valuation studies in developed countries (Lusk and Shogren, 2008). However, until recently, few studies have used the BDM mechanism in developing countries. Two exceptions are the consumer studies on micronutrient by Kiria *et al*. (2010) and De Groote *et al*. (2011).

Product attributes in the conjoint experiment

We investigated consumers' WTP for tomatoes with different credence and physical attributes. The credence attributes included inspection (inspected or not), production methods (organic or not), origin (Tanzania or imported from South Africa), and different geographical indications within Tanzania: (1) the Uluguru Mountains, which are located right outside Morogoro municipality, are less populated, have no industries, and small-scale farmers mainly produce using traditional agriculture; and (2) Kihonda, which is located within the Morogoro municipality, is highly populated, farmers practice intensive vegetable production and industries are present. Physical attributes include weight (1, 0.5, 0.2 or 0.1-kg portions) and size (big- or small-sized tomatoes). Table 1 describes the product attributes.

Table 1 Description of the product attributes

Variable	Definition	Levels
Inspected tomatoes	Tomatoes inspected by health officials and confirmed to meet the standards set by the Tanzania Bureau of Standards.	0 = Not inspected 1 = Inspected
Organic tomatoes	Naturally grown: grown with organic manure and sprayed with organic pesticides.	0 = Inorganic 1 = Organic
Origin	Production place for the tomatoes. Tanzania without further information on locality. Uluguru Mountains represent local traditional production. Kihonda represents local area with industry. South Africa is imported.	0 = Tanzania 1 = Uluguru Mountains 2 = Kihonda 3 = South Africa
Size	Size of the tomatoes.	0 = Small sized 1 = Big sized
Weight	The weight of the tomatoes.	0 = 0.1–0.2 kg 1 = 0.5 kg 2 = 1 kg

Table 2 Examples of the evaluated tomato profiles

Product number	Inspection	Organic	Origin	Size	Weight (kg)
1	None	Inorganic	Kihonda	Big	1.0
2	None	Organic	South Africa	Small	0.5
3	Inspected	Organic	South Africa	Big	1.0
4	None	Inorganic	Tanzania	Big	0.2
5	Inspected	Inorganic	Mountain	Small	0.1

Fractional factorial design for the conjoint experiment

We used a macro from SAS software (*%mktex*) to generate a fractional factorial design with 36 tomato profiles so that the attributes were not correlated among the products we presented at each session. The 36 tomato profiles were divided into three blocks of 12 profiles. Therefore, each respondent evaluated 12 tomato profiles. Examples of the tomato profiles presented to consumers are shown in Table 2. SAS reported a D-efficiency of 99.22 (100 being the max) for the total design. For a description of the SAS macro, see Kuhfeld (2010).

Procedure in the conjoint experiment

The experiment involved 18 experimental sessions conducted in May 2011. Each session lasted approximately 1 h and included 16 participants. The sessions had several parts, but in this paper, we will discuss only the incentive-aligned conjoint experiment using the BDM valuation mechanism to elicit consumer valuations for tomato attributes.

In the experiment, the participants were welcomed and were told that the session was about consumer market decision making. They were told that the objective of the study was to investigate their preference for different product attributes. The participants were presented with an envelope that included their ID number, a consent form, bidding sheets, and a monetary endowment for the participation. The participants were paid beforehand to give them a sense of ownership of their monetary endowment.

The participants were told that there would be two parts to the experiment. The first part included a hypothetical valuation experiment where they could bid on picture profiles and the second part, an incentive-aligned conjoint experiment where they could bid on real products. In the second part, they had the opportunity to buy the products using the BDM mechanism. The participants were told that the two parts were completely independent and they were asked to state the maximum amount they were willing to pay in both parts. Furthermore, we specified that we were only interested in their WTP for that particular day and not for a different day or season. For this study, we will analyse only the second part: the incentive-aligned conjoint using the BDM mechanism.

Before the BDM, (1) the different product attributes were elaborated; (2) the participants were told how the BDM mechanism worked; (3) a trial round to illustrate the BDM mechanism was done using 500-g portions of onions; (4) it was emphasized that participants were not allowed to communicate with each other; and (5) the participants inspected the different pictures and products labelled with the attribute information.

Data

Experimental area

The experiments took place in Morogoro, which is about 190 km west of Dar es Salaam. Morogoro is a town with a population of about 200 000 (URT, 2002). The main economic activities are agriculture and educational services, and the area is considered the Tanzania food basket.

Table 3 Descriptive statistics for the sample

Sample	Variable	Number of respondents	Mean	Standard deviation	Min	Max
Total sample	Female[a]	269	0.69	0.46	0	1
	Age	267	37.07	11.50	18	62
	Education[b]	269	4.39	2.67	1	10
	Income[c]	266	703.51	966.55	15	8000
Female	Age	185	36.40	10.68	18	62
	Education[b]	185	3.98	2.56	1	10
	Income[c]	184	724.69	1079.65	15	8000
Male	Age	82	38.57	12.99	18	62
	Education[b]	84	5.27	2.66	1	9
	Income[c]	82	656.00	647.81	15	2800
Low income	Female[a]	100	0.68	0.46	0	1
	Age	100	35.90	12.03	18	62
	Education[b]	100	2.65	1.42	1	7
	Income[c]	100	118.73	63.44	15	240
Medium income	Female[a]	99	0.70	0.46	0	1
	Age	98	35.79	10.78	18	62
	Education[b]	99	4.35	2.58	1	9
	Income[c]	99	478.01	176.05	250	800
High income	Female[a]	70	0.67	0.47	0	1
	Age	69	40.57	10.88	18	59
	Education[b]	70	7.00	1.99	1	10
	Income[c]	67	1913.26	1271.10	822	8000

[a]One if female, 0 if male.
[b]No education = 1; Primary = 2; Dropout secondary = 3; Secondary O-level = 4; A-level = 5; Certificate = 6; Diploma = 7; Degree = 8; Masters = 9; PhD = 10.
[c]Monthly income in 1000 TZS. TZS 1000 = US$ 0.64. Hence TZS 15 000 = US$ 9.60 and TZS 8 000 000 = US$ 5121 (31 May 2011 values according to http://www.oanda.com/).

Sample

Although the study includes only consumers from the Morogoro region, the participants represented a wide range of demographic characteristics: ages ranged between 18 and 62 years; education ranged from no education to postgraduate level (PhD); total family income ranged from 15 000 TZS/month to 8 000 000 TZS/month; and both genders were well represented in the experiment.

Participants were recruited based on their perceived income and knowledge on food and health. Participants were recruited from low- and medium-income residential areas and some were recruited at work. Every third house in each street was selected, and in case of absenteeism, the next house was selected for recruitment.

We recruited only people who participated in food purchase decisions in the family, which included either the household head or spouse. Two hundred seventy-six participants participated in the experiment, but only 269 participants completed both the survey and the experimental session. Because Tanzanian women do the majority of food shopping and make most of the decisions about food, two-thirds of those recruited were female (185) and one-third were male (84).

For the estimation, participants were divided into three income levels. Low-income consumers included 101 participants with an expected monthly income of less than 250 000 TZS (equal to US$ 160 on 31 May 2011 according to the currency converter at http://www.oanda.com/). Medium-income consumers included 98 participants with an expected monthly income between 250 000 TZS and 820 000 TZS. High-income consumers included 67 participants with an expected monthly income greater than 820 000 TZS. Table 3 summarizes the descriptive statistics for both the total sample and the subsamples used in the estimation.

Econometric model

Each of the 269 participants (i = 1–269) evaluated 12 out of the 36 product profiles (j = 1–12) by stating their WTP for the tomatoes. The product profiles had three two-level categorical attributes: inspection (x_{1ij}: 1 = inspected, 0 otherwise); production methods (x_{2ij}: 1 = organically grown, 0 otherwise); size (x_{3ij}: 1 = large, 0 otherwise); a four-level categorical attribute coded as a series of three dummies: source (x_{4ij}: 1 = Uluguru mountains, 0 otherwise; x_{5ij}: 1 = Kihonda, 0 otherwise; x_{6ij}: 1 = South Africa, 0 otherwise); and a three-level categorical attribute: weight coded with two dummies (x_{7ij} 1 = 0.5 kg, 0 otherwise; x_{8ij} 1 = 1 kg, 0 otherwise).

We analysed the data with an additive model.

$$Y_{ij} = \beta' X_{ij} + \nu_i + \varepsilon_{ij} \quad (1)$$

Where Y_{ij} is the WTP/kg by participant i for the j-th product profile, X_{ij} is a vector including the attributes of the j-th product profile offered to participant i, ν_i is the individual-specific random

Table 4 Estimated marginal WTP for tomato attributes

		Sample split on gender		Sample split on income		
	Total sample	Female	Male	Low	Medium	High
Credence attributes						
Inspected	215.58***	226.53***	188.35***	180.35***	213.81***	264.28***
	(26.69)	(32.88)	(45.65)	(45.07)	(42.09)	(54.63)
Organic	113.30***	119.80***	115.51**	137.76**	34.05	188.98***
	(26.30)	(32.01)	(46.63)	(43.61)	(42.95)	(53.21)
Mountain	–89.67**	–54.51	–158.40**	–72.87	–105.53*	–57.88
	(39.50)	(48.18)	(69.28)	(66.49)	(63.06)	(80.20)
Kihonda	–27.17	6.54	–95.31*	–8.15	–35.97	–30.74
	(33.16)	(40.44)	(57.83)	(55.21)	(53.11)	(67.28)
South Africa	–197.18***	–202.69***	–183.66**	–203.29***	–287.18***	–80.30
	(35.05)	(42.88)	(60.98)	(58.90)	(56.47)	(70.28)
Physical attributes						
Big size	110.64***	101.91***	125.24***	92.63***	85.91**	173.55***
	(25.08)	(30.66)	(43.55)	(41.81)	(40.14)	(51.02)
500-g bag	–140.95***	–172.25***	–74.06	–176.15***	–152.78*	–89.56
	(29.93)	(36.51)	(52.14)	(49.97)	(48.10)	(60.07)
1000-g bag	–221.14***	–220.73***	–222.95***	–299.75***	–206.14***	–133.56**
	(34.18)	(41.01)	(62.28)	(56.17)	(57.42)	(66.75)
Constant	433.02***	396.35***	506.96***	406.90***	543.38***	310.42***
	(48.87)	(57.72)	(90.92)	(77.30)	(83.90)	(96.78)
Sd ν	516.46***	489.67***	564.35***	467.57***	565.23***	510.18***
	(26.70)	(31.10)	(50.77)	(41.75)	(46.77)	(52.15)
Sd ε	651.25***	654.42***	640.68***	659.33***	629.55***	659.60***
	(10.47)	(12.91)	(17.78)	(17.55)	(16.67)	(21.09)
# Bid	3176	2176	1000	1183	1158	802
# Sample	269	185	84	101	98	67

Tobit analysis censored at zero. Significant results: *$P < 0.10$, **$P < 0.05$, ***$P < 0.001$.
Standard errors are in parenthesis.

term, and ε_{ij} is the residual. We followed the common practice used in similar valuation studies and estimated the BDM data with a panel Tobit model censored at zero (Lusk and Shogren, 2008).

Results

We present an analysis of WTP/kg for tomato attributes for the total samples and for subsamples divided on income and gender. When looking at the price premiums, we found in the experiment, one should keep in mind that during the experiment, the price for a kilo of tomatoes ranged between 800 TZS and 1200 TZS in Morogoro markets.

Econometric model results for the total sample

The first column with results in Table 4 presents the results for the total sample. The results show that on average, participants are willing to pay more for inspected than for uninspected tomatoes (216 TZS/kg) and more for organic than conventional tomatoes (113 TZS/kg). Both these results indicate that consumers are willing to pay a premium for foods produced under stricter food regulations. When it comes to origin, the results are a bit surprising. Firstly, the consumers preferred a generic Tanzanian origin to the two specific origins we used, both areas close to the study site. The results are understandable for tomatoes from the industrialized area Kihonda, which is associated with poor agricultural practices (–27 TZS/kg); however, it is surprising that the mountain area, which is associated with traditional agricultural practices, is discounted even more (–90 TZS/kg). The results could be an indication of people preferring products from areas they are closely associated with (consumer ethnocentrism) because our sample is drawn from the urban population in Morogoro. Alternatively, it could be that the participants are used to farmers from the mountains selling their products at low prices, and translating that into low bids in the experiment. In other words, participants anchored to prices observed outside the experiment.

Consumers also significantly discounted tomatoes from South Africa relative to tomatoes from Tanzania (–197 TZS/kg), although South Africa is believed to have higher food safety controls and regulations relative to most countries in sub-Saharan Africa. This could be due to people tending to have either loyalties towards their own country or antipathy towards other countries (Lusk *et al*., 2006). The literature on consumer preference for country of origin in the US and Europe finds similar results (Alfnes and Rickertsen, 2003; Loureiro and Umberger, 2003; Lusk *et al*., 2006; Ehmke *et al*., 2008; Costanigro *et al*., 2010).

Consumers are willing to pay a premium of 111 TZS/kg for big-sized compared with small-sized tomatoes. These results were expected, as in the focused group discussion, size, colour, firmness and non-spotted tomatoes were the most important physical attributes.

Consumers discount the 500-g tomato portions by 141 TZS/kg and the 1-kg portion by 221 TZS/kg compared with the presented 100- or 200-g portions. One of the explanations could be due to the daily shopping habits of low-income consumers. They are used to buying small portions of 100–500 g. Therefore, they most probably prefer smaller portions than a kilogram of tomatoes.

Econometric model results by gender

Comparing the bids from men and women, we can find that men bid significantly higher than women (649 vs. 577 TZS/kg). To explore their underlying preferences, we ran our Tobit model separately for the two groups. The results are presented in the second and third column of Table 4. We can see that female participants are willing to pay slightly, but not significantly, more for inspected (227 TZS/kg) and organic tomatoes (120 TZS/kg) compared with the male participants (188 and 116 TZS/kg, respectively). However, for both male and female participants, the preferences for food safety do not translate into their preferences for origins associated with better agricultural practices. Both discount tomatoes from safer areas compared with unsafe areas, and both show loyalties towards their country and antipathy towards South Africa. Women have a higher and more significant discount for tomatoes from South Africa, while men have a significant discount for tomatoes from the mountains and have a significant preference for tomatoes from Tanzania.

Econometric model results by income

Comparing the bids over the three income groups, we find that average bids are correlated with income. High-income consumers have the highest WTP (648 TZS/kg) followed by middle-income consumers (625 TZS/kg) and then low-income consumers (538 TZS/kg). To explore their underlying preferences, we ran our Tobit model separately for the three income groups. The results are presented in the last three columns of Table 4. Consumers in all income groups are willing to pay a significant premium for inspected tomatoes, and their WTP is correlated with income. However, we do not see the same income effect when comparing WTP for organic tomatoes. The participants in the high-income group are willing to pay the highest premium for organic tomatoes (189 TZS/kg). However, the low-income consumers are willing to pay a significantly higher premium for organic tomatoes (137 TZS/kg) than the middle-income consumers (34 TZS/kg). The results on WTP for organic for the low- and medium-income groups are somehow contrary to the literature on income effect (Wang and Sun, 2003; Smith *et al*., 2009; Yu and Abler, 2009; Kikulwe *et al*., 2011).

None of the groups are willing to pay a premium for products from safe compared with unsafe origins in Tanzania. Furthermore, participants from all income groups discount tomatoes from South Africa compared with Tanzania, but the highest income group had the least discount. This could be influenced by education, knowledge, income and experience. It is likely that participants in the high-income group had better knowledge than the others about differences in food safety standards between Tanzania and South Africa, but the decision in all groups are likely affected by ethnocentrism.

Conclusion

In recent years, there have been studies showing poor food safety practices in Tanzania, but until now, the market has not provided Tanzanian consumers with much choice with respect to food safety. From the findings of this study, we can conclude that consumers of both genders and all income groups have preferences for food safety and are willing to pay a premium for product attributes that can be associated with food safety. From the study, we can conclude that inspection is the most valued attribute associated with food safety, and it is significant across the different income and gender groups. Organic production is also an important attribute when considering pesticide residues and heavy metals. The price premium for organic products is positive, but in some groups insignificant. When it comes to origin, it seems like ethnocentrism outweigh food safety considerations when consumers make their decisions.

Acknowledgements

The authors are grateful for the financial support from the Norwegian Agency for Development Cooperation (Norad) through the NUFU project: 'Empowering women to participate in higher level of fruits and vegetables value chain through production of dried fruits'. We specifically thank the project leaders, Dr Anna Temu and Professor Trude Wicklund, for their cooperation in this work. We also thank Shose Rodrick for assisting in preparing and conducting the experiments.

References

Alfnes, F. & Rickertsen, K. (2003) European consumers' willingness to pay for US beef in experimental auction markets. *American Journal of Agricultural Economics*, **85**, 396–405.

Andrew, F. (2011) Tanzania Government Lays Stress on Food Safety, Quality. *The Guardian*. [WWW document]. URL http://in2eastafrica.net/tanzania-govt-lays-stress-on-food-safety-quality/ (accessed on 10 July 2011).

Bahemuka, T. & Mubofu, E. (1999) Heavy metals in edible green vegetables grown along the sites of the Sinza and Msimbazi rivers in Dar es Salaam, Tanzania. *Food Chemistry*, **66**, 63–66.

Becker, G.M., DeGroot, M.H. & Marschak, J. (1964) Measuring utility by a single response sequential method. *Behavioral Science*, **9**, 226–232.

Byrne, P.J., Toensmeyer, U.C., German, C.L. & Muller, H.R. (1992) Evaluation of consumer attitudes towards organic produce in Delaware and the Delmarva region. *Journal of Food Distribution Research*, **23**, 29–44.

Costanigro, M., Kroll, S., Thilmany McFadden, D. & Nurse, G. (2010) Local and organic: substitutes or complements? An in-store evaluation of labels for apples. Paper presented at the Agricultural and Applied Economics Association conference 2010. [WWW document]. URL http://Purl.umn.edu/61537 (accessed on 10 October 2011).

De Groote, H., Kimenju, S.C. & Morawetz, U.B. (2011) Estimating consumer willingness to pay for food quality with experimental auctions:

the case of yellow versus fortified maize meal in Kenya. *Agricultural Economics*, **42**, 1–16.

Depositario, D.P.T., Nayga Jr, R.M., Wu, X. & Laude, T.P. (2009) Effects of information on consumers' willingness to pay for golden rice. *Asian Economic Journal*, **23**, 457–476.

Ehmke, M.D., Lusk, J.L. & Tyner, W. (2008) Measuring the relative importance of preferences for country of origin in China, France, Niger, and the United States. *Agricultural Economics*, **38**, 277–285.

International Monetary Fund (2011) World economic outlook database. [WWW document]. URL http://www.imf.org/external/pubs/ft/weo/2011/01/weodata/index.aspx (accessed on 9 November 2011).

Kikulwe, E.M., Wesseler, J. & Falck-Zepeda, J. (2011) Attitudes, perceptions, and trust: insights from a consumer survey regarding genetically modified banana in Uganda. *Appetite*, **57**, 401–413.

Kimenju, S.C. & De Groote, H. (2008) Consumer willingness to pay for genetically modified food in Kenya. *Agricultural Economics*, **38**, 35–46.

Kiria, C.G., Vermeulen, H. & De Groote, H. (2010) Sensory evaluation and consumers' willingness to pay for quality protein maize (QPM) using experimental auctions in rural Tanzania. Paper presented at the African Association of Agricultural Economist confernce 2010. [WWW document]. URL http://purl.umn.edu/96417 (accesed on 30 July 2011).

Kuhfeld, W.F. (2010) Marketing research methods in SAS experimental design, choice, conjoint, and graphical techniques. [WWW document]. URL http://support.sas.com/techsup/technote/mr2010.pdf (accessed on 12 February 2011).

Lagarkvist, C.J., Hess, S., Ngigi, M.W. & Okello, J. (2011) Consumer's willingness to pay for food safety in Nairobi: the case of fresh vegetables. Paper presented at the European Association of Agricultural Economists conference 2011. [WWW document]. URL http://purl.umn.edu/114409 (accessed on 10 October 2011).

Lewis, C., Newell, J., Herron, C. & Nawabu, H. (2010) Tanzanian farmers' knowledge and attitudes to GM biotechnology and the potential use of GM crops to provide improved levels of food security. A qualitative study. *BMC Public Health*, **10**, 407.

Loureiro, M.L. & Umberger, W.J. (2003) Estimating consumer willingness to pay for country-of-origin labeling. *Journal of Agricultural and Resource Economics*, **28**, 287–301.

Loureiro, M.L. & Umberger, W.J. (2007) A choice experiment model for beef: what US consumer responses tell us about relative preferences for food safety, country-of-origin labeling and traceability. *Food Policy*, **32**, 496–514.

Lusk, J. & Shogren, J.F. (2008) *Experimental Auctions: Methods and Applications in Economic and Marketing Research*. Cambridge University Press, New York, NY.

Lusk, J.L. & Briggeman, B.C. (2009) Food values. *American Journal of Agricultural Economics*, **91**, 184–196.

Lusk, J.L., Brown, J., Mark, T., Proseku, I., Thompson, R. & Welsh, J. (2006) Consumer behavior, public policy, and country-of-origin labeling. *Applied Economic Perspectives and Policy*, **28**, 284–292.

Mørkbak, M.R., Christensen, T., Gyrd-Hansen, D. & Olsen, S.B. (2011) Is embedding entailed in consumer valuation of food safety characteristics? *European Review of Agricultural Economics*, **38**, 1–21.

Ndengerio-Ndossi, J. & Cram, G. (2005) Pesticide residues in table-ready foods in Tanzania. *International Journal of Environmental Health Research*, **15**, 143–149.

Ngowi, A., Mbise, T., Ijani, A., London, L. & Ajayi, O. (2007) Smallholder vegetable farmers in Northern Tanzania: pesticides use practices, perceptions, cost and health effects. *Crop Protection*, **26**, 1617–1624.

Otter, T., Tuchler, R. & Fruhwirth-Schnatter, S. (2004) Capturing consumer heterogeneity in metric conjoint analysis using Bayesian mixture models. *International Journal of Research in Marketing*, **21**, 285–297.

Shemdoe, R.S. (2010) Heavy metal concentrations in soils and leachetes of Mtoni dumpsite bordering the Indian Ocean in Dar es Salaam, Tanzania. *Scientific Research and Essays*, **5**, 2143–2147.

Smith, T.A., Huang, C.L. & Lin, B.H. (2009) Does price or income affect organic choice? Analysis of US fresh produce users. *Journal of Agricultural and Applied Economics*, **41**, 731–744.

URT (2002) *Morogoro Region Socio-Economic Profile*. National Bureau of Statistics and Morogoro Regional Commissioner's Office, Dar es Salaam, Tanzania.

Vermeulen, B., Goos, P. & Vandebroek, M. (2008) Models and optimal designs for conjoint choice experiments including a no-choice option. *International Journal of Research in Marketing*, **25**, 94–103.

Wang, Q. & Sun, J. (2003) Consumer preference and demand for organic food: evidence from a Vermont survey. Paper presented at the Agricultural Economics Association 2003 Annual meeting. [WWW document]. URL http://purl.umn.edu/22080 (accessed on 28 July 2011).

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

Yu, X. & Abler, D. (2009) The demand for food quality in rural China. *American Journal of Agricultural Economics*, **91**, 57–69.