Innovations in the agro-food system: adoption of certified organic food and green food by Chinese consumers

Abstract

Purpose

The purpose of this paper is to identify the factors driving the adoption of 'green innovations' notably green food and certified organic food and to examine the attitudes of Chinese consumers towards genetically modified food.

Design/methodology/approach

A mixed methods approach was used. A total of 402 consumers responded to a structured questionnaire and 58 consumers responded to a survey designed to gather qualitative data. Data analysis involved content analysis, the probit model, frequency distributions and the t test for two unrelated means.

Findings

This study shows that affluent, middle class Chinese citizens are opting out of the conventional food market. There is a gender divide, with men showing a preference for green food and females showing a preference for certified organic food. Certified food purchase is associated with demographic variables, such as income, education, age, gender, presence of young children, household size, living in developed cities and overseas experience. A follow-up study shows that the absence of GMOs (genetically modified organisms) motivates the purchase of organic food. Overall, the results suggest that Chinese consumers are turning towards certified food for health reasons and are sceptical about GM food.

Practical implications

This paper provides some insights into how Chinese consumers view innovations in the food sector. The study found that almost half of the sample is unaware that the concept of green food is different to that of organic food. The priority for the certified organic industry is to address this lack of knowledge and clearly explain what certified organic food is and how it differs from green food. Small-scale farmers could use consumer aversion to GMOs as a promotional tool. The ultimate goal of this paper is to help marketers better promote certified organic food, but inferences can be drawn in terms of Chinese sustainable consumption. Negative attitudes towards genetically modified foods exist due to human health concerns. Hence, Chinese policy makers need to confront these perceptions, real or perceived, if they wish to maintain public trust in biotechnology.

Originality

The contribution of this research lies in examining what drives the adoption of 'green innovations', notably green food and certified organic food in China. This research is important given that little is known about what Chinese consumers think of, and how they react to, innovations in the agro-food value chain.

Article classification: research paper

Keywords: innovation, certified organic food, green food, genetically modified food, China, probit model

Introduction

The agro-food sector refers to the production, processing and inspection of food products made from agricultural commodities. It cuts across various industries and consists of commodity sub-sectors such as grain, dairy, coffee, fruit, vegetables, cotton and so forth (Caiazza and Volpe, 2012). Innovation in agro-food can refer to a new product (input or output), a process, a marketing strategy, a business practice, an organisation or external practice (Caiazza, 20 14). Based on this definition, genetic modification (GM) techniques represent a major innovation in agro-food value chains. By moving "genes" within and between crop species, farmers and plant breeders can retain and use the crosses that exhibit desirable traits. The main advantages of transgenic crops are resistance to herbicides, resistance to insect pests, enhanced nutritional properties (e.g. high polyunsaturated oil content) or properties which increase shelf life, handling and value to weight ratio (Walsh, 2002). The FAO's official statement on biotechnology is that it "provides powerful tools for the sustainable development of agriculture, fisheries and forestry, as well as the food industry…which can be of significant assistance in meeting the needs of an expanding and increasingly urbanised population in the next millennium" (FAO, 2000). The potential of GMOs (genetically modified organisms) to contribute to sustainable farming (Ammann, 2008), food security and poverty reduction (Qaim, 2009) makes it a worthwhile topic in sustainable consumption. The FAO (2000) acknowledges that GMOs have become the target of a very intensive and, at times, emotionally charged debate. Due to concern about the long-term effects of GMOs on nature and human health, some countries have adopted strict labelling laws. Thresholds for triggering labelling of GM content have been set, such as 0.9% in the EU and Russia and 1% in Australia and New Zealand. It has been noted that the delivery of a 100% pure product is virtually impossible given the widespread and increasing use of GM technology in global agriculture (Moses and Brooks, 2013). Although biotechnology can have effects that are positive for the environment (i.e., lower chemical treatments), GMOs are banned in organic farming. GMOs threaten organic agriculture due to the risk of cross pollination from neighbouring transgenic crops and difficulty of obtaining non-GMO seed for organic production (Klonsky, 2000). There is also the risk of creating weeds resistant to pests and herbicides; harm to beneficial predators of crop pests (Walsh, 2002; Ceccarelli, 2014) along with biodiversity threats (United Nations Development Program, 2001).

China is the fourth largest producer of genetically modified crops in the world and continues to support biotechnology research in an effort to sustain food self-sufficiency policies (Curtis, McCluskey and Wahl, 2004). Academic studies have reported positive attitudes towards GM foods in China (Huang *et al.*, 2006). Some reasons for positive attitudes are the positive media coverage (which is controlled by the government) and positive attitudes toward scientific discovery (Li, Curtis, McCluskey and Wahl, 2002). However, it has been reported that GM crops have been grown illegally in China and the Chinese government has been widely criticized for failing to control their spread (Jian, 2014). Furthermore, China has experienced several food safety scandals that may change attitudes towards innovation. In September 2008, China's Health Ministry initiated a recall of powdered infant formula that had been contaminated with melamine, an industrial chemical. More food scandals followed and a new phrase was added to the Chinese vocabulary, "poisonous food". This led the affluent and more privileged Chinese to draw upon superior economic resources and social networks abroad to secure foreign infant formula (Hanser and Li, 2015). Since then, there has been acute public concern with food safety and urban, middle class consumers show a willingness to pay a premium for safe food (Liu, Pieniak and Verbeke, 2013). The prevalence of food safety scandals has led the Chinese central government to strongly support the green food market (Geng, Trienekens and Wubben, 2013). Studies show that Chinese consumers are responding

positively to certifications associated with sustainable food (for example Yu *et al.* 2014). However, there is a lack of understanding of how Chinese consumers reconcile GMOs with sustainable food. Sustainable agro-food systems embody a complex set of attributes such as respect for environmental limits, high standards of animal welfare, affordable food for all sectors of society, support for rural economies and a viable livelihood for farmers (von Meyer-Höfer *et al*., 2015). Organic and GMO-free does not necessarily mean sustainable. Sustainable agriculture seeks to address both the ecological and social problems associated with modern, industrialized agriculture. It has been argued that while organic farming seeks to minimise environmental impacts at the production site, it does nothing to address social-justice and community issues (Connor and Christy, 2004). It does not directly address food security issues or the economic viability of farming communities in rural China.

Literature review

The diffusion and adoption of new products, services, processes and systems has been extensively studied in the management literature. Although studies of diffusion tend to linked with the high technology sector, in recent years, there is growing interest in studying mature industries such as the agro-food sector (Caiazza, 2015). At the macro (country) level, there is a good understanding of the role of the government in overcoming barriers to the diffusion of innovation (Caiazza *et al.,* 2015; Caiazza *et al.,* 2016). This paper, however, focuses on micro level factors, such as consumer demand and attitudes towards innovation. Adopters can be reluctant to use an innovation for many reasons, such as the functional, physical, social, psychological and time-related risks associated with adoption (Caiazza *et al.,* 2014). The adoption of innovations in the Chinese agro-food sector, such as organic food and GMOs, is not well understood in the literature. GM-free labels are unobtrusive in China and GM claims tend to be subsumed under two labels, the green food label and the certified organic label. Green food refers to a certification scheme that is unique to China and it is comparable to, but differs from, organic products (Marchesini, Hasimu and Spadoni, 2010). The ecological labels for green food and organic food are shown in Figure 1. Green food refers to the "controlled and limited use of synthesized fertiliser, pesticide, growth regulator, livestock and poultry feed additive and gene engineering technology" (Liu, Pieniak and Verbeke, 2013:94). Organic food is certified to international standards such as IFOAM, the International Federation of Organic Agriculture Movements (Paull, 2008) and hence GM ingredients are shunned on ideological grounds. However, not every organic food consumer is automatically opposed to GM food. A study of Western consumers identified three consumer segments: the opponents, the proponents and the neutrals, distinguished by their beliefs, attitudes and purchase intentions. The opponents reject the use of genetic modification in organic food production. The neutrals are neither against nor in favour of GM food, while the proponents support GM in food production (Verdurme *et al.,* 2002). The primary driver of demand for green food is the lack of confidence in the safety of Chinese produce (Zhou, Huo and Peng, 2004; Morgan and Wright, 2014), along with improvement in living standards and the expansion of the middle class (Zhang and Han, 2009; Zhong and Yi, 2010; Sun and Mu, 2012; Zhu *et al*., 2013). There is evidence of a lack of institutional trust and Chinese consumers worry that enforcement of food safety regulations is weak (Jin, Lin and Yao, 2011). This lack of trust also applies to certified organic food produced in China, with consumers being sceptical of the chemical-free claim (Yip and Janssen, 2015). Despite this mistrust, Paull (2008) predicts a steadily migration from green food to organic food, with the non-certified sector continuing to shrink (Paull, 2008).

Figure 1: Chinese Green Food and Organic Food Quality Certification Signs.

From a marketing perspective, it is critical to understand how Chinese consumers view innovations in the agro-food system and who adopts them. The number of studies conducted on Chinese consumers and organic food is growing (Roberts and Rundle-Thiele, 2007; Yin, Wu, Du and Chen, 2010; Sirieux *et al*., 2011; Bing *et al*., 2011; Lobo and Chen, 2012; Marchesini *et al*., 2012; Thøgersen and Zhou, 2012; Thøgersen *et al*., 2015; Yip and Janssen, 2015). The literature shows that gender, age, family size and average household income per year are the main socio-economic factors influencing willingness to pay for green food (Xia and Zeng, 2007; Xia and Zeng, 2008). Research on Western consumers indicates that organic food buyers exist across all demographic segments, with some small trends being evident. In particular, they may have higher levels of education, be more affluent, be women and have young children (Pearson *et al*., 2011). Demand for organic food is strongly linked to beliefs about its healthiness, taste and environmental friendliness. Chinese organic food consumers have similar values to Western consumers and early adoption of organic food in China is positively related to what Schwartz termed 'universalism values' (Thøgersen *et al*., 2015). The barriers to the purchase of certified food are high, notably high prices and lack of availability (Zhu, Li, Geng and Qi, 2013; Xie *et al*., 2015). Given that the Chinese government has embraced both green food labels and GMOs, the complexities of consumer behaviour need to be examined. Marketers need to know whether the GM-free claim is important to buyers of certified food.

Methodology

The purpose of this paper is to identify the determinants of green food and certified organic food purchase. Based on the literature review, the following hypotheses have been advanced:

H1: The adoption of a 'green' innovation is influenced by demographic factors, notably gender, presence of children in the household, education and income.
H2: Chinese consumers are motivated to adopt 'green' innovations for health and environmental reasons.

The population of interest was consumers of certified food in urban China. The survey instrument was originally developed in English and translated into Chinese. The survey contained a section on socio-demographic information and it covered purchase motivations, sources of information used in decision-making, outlets used to buy food, willingness to pay a premium for green food and consumer attitudes towards food safety. The survey was pilot tested on a convenience sample. Based on feedback from the participants, some questions were reworded to avoid ambiguity. The statistical analysis was done using SPSS Stata.

An online and paper-based survey was conducted in 2014. The internet was used to save time and money and access a large number of participants (Sue and Ritter, 2007) and it is a good way of recruiting the affluent segments of Chinese society (McKinsey, 2013). A hyperlink to the survey was placed on a wine merchant channel in order to increase the response rate. Food and wine are complimentary and wine buyers are likely to be green food buyers. Studies on wine consumption report that Chinese red wine consumers are in the higher income and

education categorisations (Gong et al., 2004; Balestrini and Gamble, 2006) and these findings mirror studies on green food consumption. A total of 402 consumers responded to the survey. The summary statistics of the sample are as follows: there was a female bias with 60% females and 40% males. Most respondents were young and 62% were aged in the 26-45 age category. Household income was relatively high with 24% earning between $1,732 and $3,464 a month (6,000 to 10,000 yuan). The respondents were well educated with 42% having an undergraduate degree (see Table 1).

Table 1: Summary of findings on demographics

Variable		**Responses**	**Percentage**
Gender	Male	161	40.0
	Female	241	60.0
Age	Below 18	6	1.5
	18 - 25	82	20.4
	26 - 35	125	31.1
	36 - 45	125	31.1
	46 - 55	39	9.7
	56 and over	25	6.2
Married	Yes	322	80.0
	No	80	20.0
Children	No children	48	11.9
	Young children – aged below 12	176	43.8
	Older children – aged 12 and over	98	24.4
Household Income	Less than 3000 RMB	25	6.2
	3,001 to 6,000 RMB	82	20.4
	6,001 to 10,000 RMB	97	24.1
	10,001 to 20,000 RMB	89	22.1
	20,001 to 30,000 RMB	68	16.9
	30,001 to 50,000 RMB	32	8.0
	More than 50,000 RMB	9	2.2
Education	Senior High School or below	26	6.5
	Technical and/or Vocational School	24	6.0
	Junior colleges	81	20.1
	Undergraduate	170	42.3
	Post-graduate	101	25.1
Occupation	Company staff/clerical	141	35.1
	Public servant	35	8.7
	Business person	33	8.2
	University student	70	17.4
	Military	4	1.0
	Doctor	3	0.7
	Teacher and/or researcher	68	16.9
	Labourer & related	13	3.2
	Home duties	12	3.0
	Retired	16	4.0
	Other	7	1.7

Note: approximately 1 Chinese Yuan/Renminbi = 0.1732 AUD. n=402

A qualitative study was conducted after the results of the survey were analysed. The primary objective of this second study was to examine the attitudes of Chinese consumers towards genetically modified food. The target population of this study was consumers who had already bought organic/green food. It is important to note that our sample was a convenience sample and not representative of the Chinese population. The quantitative survey showed that the absence of GMOs was an important factor driving the purchase of certified organic food. The

second study was a follow-up study used to determine the sources of consumers' resistance to GMOs. The research questions were as follows:

- What were the reasons that caused consumers to avoid GMOs?
- Was the decision to avoid GMOs explained by variables relating to personal health or environmental concern?
- Where did consumers obtain information on GM food?
- How did Chinese consumers deal with potential food risks?

Basic demographic data was also gathered. Qualitative research was adopted for the following reasons. Firstly, it is argued that quantitative studies are not geared to understanding the complexity of organic food purchasing habits and that mixed methods provide a potentially deeper insight into consumer behaviour (Xie *et al*., 2015). Secondly, there is a lack of empirical investigations on this topic (Li *et al.*, 2002; Huang *et al.*, 2006). Thirdly, it enables the probing of responses to the online survey, which adds depth and richness to the data.

Content analysis is classified primarily as a qualitative research method. It generally involves analysing textual data that is generally obtained from open-ended survey questions, interviews, focus groups or print media (Kondracki & Wellman, 2002). It is defined as "a research method for the subjective interpretation of the content of text data through the systematic classification process of coding and identifying themes or patterns" (Hsieh & Shannon, 2005, p. 1278). In the context of this study, textual data was obtained from open-ended survey questions. The data was read and re-read to identify common words, particular phrases used or themes. Since the amount of data gathered was not large, computer assisted analysis was not necessary. Table 2 offers a profile of the respondents. As shown, there were 58 respondents. The respondents were primarily young females, in the 35 to 44 age category, living in tier 2 and 3 cities, married and with a child. None of the respondents were University educated. Many were earning between $1,045 and $2,090 a month, or 5,000 to 8,000 yuan (see Table 2).

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Table 2: Profile of respondents in qualitative survey

Variable		**Responses**	**Percentage**
Gender (n=58)	Male	18	31.0
	Female	40	69.0
Age (n=58)	Below 18	1	1.7
	18-24	10	17.2
	25-34	8	13.8
	35-44	37	63.8
	45-54	2	3.4
	55 and above	0	0.0
City Tier (n=54)	1st	7	13.0
	2nd	25	46.3
	3rd	22	40.7
Education (n=56)	Primary	1	1.7
	Middle school	1	1.7
	Senior high school	3	5.2
	Technical/vocational	32	55.2
	Junior college	21	36.2
	Undergraduate	0	0.0
	Postgraduate	0	0.0
	Other	0	0.0
Household Income (n=56)	3000 RMB and below	4	7.1
	3001-5000	11	19.6
	5001-8000	16	28.6
	8001-10000	10	17.9
	10001-20000	6	10.7
	20001-30000	3	5.4
	30001-50000	6	10.7
	50001 and above	0	0.0
Married (n=58)	Yes	42	72.4
	No	14	24.1
	Divorced	2	3.4
With children (n=58)	Yes	37	64.0
	No	21	36.0

The probit model

Probit models are used whenever the dependent variable is binary and assumes two values, such as 0 or 1. For example, is the respondent a buyer of organic food or a non-buyer, yes or no? Probit regression is a nonlinear regression model that forces the output (Y), the predicted values, to be either 0 or 1. Probit models estimate the probability of a dependent variable to be 1 (Y=1), which is the probability of some event happening (Green, 2002). The name, probit, is an amalgam of the words probability and unit. Probit models were originally used in toxicology studies and are now used in diverse fields such as food marketing (Verbeke, 2005) and econometrics (Maddala 1983; Ben-Akiva and Lerman, 1985). Probit modelling was used

to test the impact of demographic factors on organic and green food purchase. The independent variables used in the probit model for this study are shown in Table 3. Demographic variables, such as income, age and education, were categorical in nature.

Table 3: Definitions of independent variables used in the probit regression model

Independent variables	**Description**
Income	Monthly household income level (categories 1-8)
Age	Age group (categories 1-6)
Education	Highest education level attained (categories 1-8)
Gender	Dummy variable, 1 stands for male
Overseas experience	Dummy variable, 1 stands for overseas experience
Presence of child	Dummy variable, 1 stands for having a child
City tiers	City tiers 1-3 (first tier cities include Beijing, Shanghai, Tianjin and Chongqing; second tier cities include capital cities at provincial level and in special economic zones; third tier covers other areas surveyed).

The probit model can be summarised by the following equations. Utility is derived from the selection of an alternative j ($j = 1,0$) by the individual i ($i = 1,.....t$) and that choice is a function of the attributes (e.g., price, quality) of that alternative to the individual and the characteristics (e.g., income, educational attainment, presence of young children) of the individual. It is assumed that the decision of the ith household consumer to buy green food or not depends on an unobserved utility index I_i (threshold) that is determined by explanatory variables in such a way that the larger the value of the index I_i, the greater the probability of the household buying green food (P_i). The index I_i is defined as follows:

$$I_i = x_i^{'}\beta + \mu_i \qquad \ldots (1)$$

In practice, I_i is unobservable. If the threshold is set to zero (in fact, the choice of a threshold value is irrelevant, as long as a constant term is included in x_i), then a dummy variable y_i is observed:

$$\begin{aligned} y_i &= 1 \quad if \quad I_i > 0 \\ y_i &= 0 \quad otherwise \end{aligned} \qquad \ldots (2)$$

To capture the relationship between I_i and P_i, the probability of observing the values of one and zero is modelled as follows:

$$\Pr(y_i = 1 | x_i; \beta) = \Pr(I_i > 0) = 1 - F_{\mu_i}(-x_i' \beta)$$
$$\Pr(y_i = 0 | x_i; \beta) = -F(-x_i' \beta) \quad \ldots (3)$$

F_{μ_i} is the cumulative distribution function (CDF) of μ_i, which takes a real value and returns a value ranging from zero to one. In the probit model, μ_i in the regression of latent dependent variables follows a standard normal distribution. In the logit model, μ_i in the regression of latent dependent variables follows a logistic distribution. Given a sample of n observations, a likelihood function (4) can be developed from the above design and maximised with respect to β in order to obtain the maximum likelihood estimates (MLE) $\hat{\beta}$ (Maddala, 1983). The likelihood function is given by:

$$l(\beta) = \log L(\beta) = \sum_{i=0}^{n} y_i \log(1 - F(-x_i' \beta)) + (1 - y_i) \log F(-x_i \beta) \quad \ldots (4)$$

Findings

The following section describes results from the probit model. Table 4 shows the results of the probit model for green food purchase: the coefficients, their standard errors, the z-statistic and associated p-values. A measure suggesting the goodness of fit of probit models is the percentage of observations that are correctly predicted by the model (Green, 1992). The pseudo R^2 measure conforms with the classical R^2 in the linear regression in that a value of 0 corresponds to no fit and a value of 1 corresponds to perfect fit. The R^2 value in Table 4 is 0.09 (which means our model explain 9% of green food purchase) however there is no benchmark R^2 value the needs to be achieved before one can declare the model to be successful. There are other statistics which can be used to evaluate the performance of a model. The likelihood ratio (LR) indicates if the model as a whole is statistically significant (that is, it fits significantly better than a model with no predictors). Results show that the likelihood ratio chi-square of 54.45 has a p-value of 0.0001 which is statistically significant.

Turning to the other components of the model, Table 4 shows the p-value (< 0.05) for several predictors. Results show that age, gender, presence of young children in the family, family size, education, income and overseas experience have an impact on green food purchase. One must also interpret the sign which makes the outcome more or less likely; for instance, age has a negative sign, meaning that as age increases, green food purchase is likely to decrease. Hypothesis 1 was confirmed. Income, age, gender, presence of young kids (12 years old and under), family size are significant at the 5% level. Higher education and having overseas experience are significant at the 10% level. Age (older), gender, family size (larger), and education attainment below university are negatively related to green food purchase. Young, wealthy males, who have young children and who live in a small household are likely to be buyers of green food.

Table 4: Estimates of the probit model for green food purchase

Variables	Coef.	Std. Err.	z	P>z
Age	-0.1	0.	-2.0	0.04 **
Gender	-0.3	0.1	-2.3	0.02 **
Presence of kids under 12 years old	0.2	0.1	2.4	0.01 **
Family size	-0.2	0.1	-2.3	0.02 **
Education attainment below university	-0.3	0.2	-1.8	0.06 *
Income	0.1	0.1	2.1	0.03 **
Overseas	0.2	0.1	1.7	0.08 *
_cons (Intercept/constant term)	0.2	0.4	0.4	0.70
LR chi2(8)		54. 5		
Log likelihood		-248.5		
Pseudo R2		0.1		

Note: ** indicates 5% significance and * indicates 10% significance.

Table 5 (see below) shows the results of the probit model for organic food purchase. Income, age and gender, are significant at 5% level. Income, female, and living in tier 1 cities are positively related to certified organic food purchase. Older age, larger family size and lower levels of educational attainment are negatively related to certified organic food purchase.

Table 5: Estimates of the probit model for organic food purchase

Variables	Coef.	Std. Err.	Z	P>z
Age	-0.2	0.1	-2.1	0.04 **
Gender	0.4	0.2	2.1	0.03 **
Family size	-0.2	0.1	-1.9	0.06 *
Education attainment below university	-0.5	0.2	-2.2	0.03 **
Income	0. 6	0.1	8.0	0.00 **
Location (1st tier)	0.2	0.1	1.9	0.05*
_cons (Intercept/constant term)	-2.3	0.5	-4.2	0.00 **
LR chi2(8)		148.8		
Log likelihood		-164.4		
Pseudo R2		0.3		

Note: ** indicates 5% significance, and * indicates 10% significance.

Consumer motivations and benefits sought from certified food

All consumers scored medium to high on all items related to reasons to buy green food (M>3 on a 5-point Likert scale). While most of the motivating factors were considered important, the green food label, coming from humanely-treated stock; environmentally-friendly, absence of GM ingredients, health and safety, all received the highest scores. An independent samples t-test was performed and the certified organic food buyers rated the "does not contain genetically modified food ingredients" attribute and "improve the future health of my family" slightly higher in importance than the non-organic food buyers (see Table 6). Levene's test was not significant, consequently, the t value based on equal variances was selected. This was

significant with a two-tailed p value of .039 for ‘no GM foods’ and .019 for ‘protect the health of my family’. No significant differences between the two groups were identified with regard to the other attributes.

It must be noted that 42% of the sample was unware that there was a difference between green food and certified organic food. This misapprehension on the part of the consumers may have positive or negative impacts on purchasing intentions and behaviour – but this was not tested in this survey.

Table 6: Reasons for buying green food

Reasons	**Overall Sample**	**Certified Organic Buyers**	**Non-Certified Buyers**
The green food I buy is competitively priced.	3.71	3.74	3.70
The food I buy has the green label and is pesticide reduced.	4.00	4.08	3.97
The green food I buy helps support Chinese farmers.	3.77	3.84	3.74
The green food I buy has a well-known brand name or comes from a well-respected region.	3.32	3.25	3.35
Produce is fresh.	3.81	3.88	3.77
The green food I buy comes from a farmers market and there is a long-term, trusting relationship with grower.	3.48	3.43	3.50
Sourced within season.	3.73	3.62	3.77
Tastes good.	3.62	3.71	3.58
Comes from humanely treated livestock.	4.04	4.14	3.99
Environmentally-friendly in the way it is produced, packaged and transported.	4.12	4.24	4.07
Does not contain genetically modified ingredients.	4.11	4.27**	4.06
Green food will improve my future health.	4.18	4.27	4.15
Green food will improve the future health of my family.	4.23	4.37**	4.18
Green food is safe.	4.20	4.23	4.19
Green food is high quality and has high nutritional value.	4.05	4.16	4.01
Green food is easy to buy.	3.38	3.33	3.40
Green food is easy to prepare.	3.43	3.37	3.45

** sig. $p < 0.05$

Note: Purchase motivations were measured on a 5 point importance scale, where 1= not at all important and 5 = very important.

Resistance to GM food

The qualitative study highlighted the importance given to health and food safety. An open-ended question: "why do you buy organic food?" was posed and content analysis showed that health and safety was much more important to this sample than environmental considerations. When asked what good health meant to them, the answers were generally: "not getting ill; feeling energetic; body in good condition and no pollution". The respondents appear to be apprehensive about the health effects of GM foods. All of the respondents (n=58) had heard of GMOs and the vast majority of respondents (83%) stated that they did not want to buy GM foods. The main reasons given were as follows: "harmful for human body, not healthy, uncertainty". Respondents were asked to comment on how they were dealing with risks in the food chain. The results showed they were proactive and were using a variety of strategies to deal with risk. Comments were as follows: "buying direct from farmers; purchase of overseas products; purchasing from formal channels; purchase from big supermarket; cooking from home; buying certified food; not eating out; watching and analysing news reports; washing carefully; planting vegetables at home, choosing food in-season, not buying unknown foods, listening to friends; doing research; purchasing popular products". Interestingly, only 31% of the sample knew that GMOs were not permitted in certified organic food, suggesting a knowledge deficit. When respondents sought to obtain information on food risks, the internet was cited most frequently as an information channel, along with friends and advertisements.

Discussion and contributions to the literature

There has been a substantial amount of literature addressing organic food consumption and sustainable consumption in general but most of it has focused on the developed world. However China is a large economy and calls have been made to understand the factors that motivate sustainable consumption in emerging markets (Thøgersen, Zhou and Huang, 2015). Our study found that green food seems to be favoured by wealthy, educated Chinese males who have a young child. Most of these findings are in accordance with the literature. China's one-child policy, launched in 1978, suggests that parents are committed to giving their children the best (Xie *et al*., 2015). A study by Zhu *et al*., (2013) found that income and education influence green-food purchase intentions and behaviours. Chinese studies report that gender – being female - is an important demographic variable, along with income, education and family size, that influences willingness to pay for green food (Xia and Zeng, 2007; Xia and Zeng, 2008). Studies on Western consumers show that concern for young children is likely to increase organic food consumption (Kriwy and Mecking, 2012); the organic food buyer is likely to be female (Lockie *et al.*, 2004), female with children (Dettmann and Dimitri, 2009; Van Doorn andVerhoef, 2011) and is likely to be highly educated (Govidnasamy and Italia, 1990; Kriwy and Mecking, 2012).

The gender divide in terms of certified organic food purchase is interesting. It may simply reflect the role of women in buying food, their superior knowledge of certified organic food and interest in protecting the health of their children. It may reflect barriers to certified organic food purchase faced by males, notably lack of familiarity with the label, doubt about certified traceable food and worries about excessively high prices (Wu, Xu and Gao, 2011; Liu *et al*., 2012). The problem of fraud, where companies falsely advertise pesticide-treated produce as organic, is an ever-present concern, leading to a large trust deficit (Marchesini *et al*., 2012; Li, Ge and Bai, 2013).

This research indicates that Chinese consumers who buy green food or certified organic food seek similar benefits. They are not that different from Western consumers who are motivated to buy organic food primarily out of health concerns, with product quality and concern about environmental degradation also acting as motivating factors (Pearson, 2002; Yiridoe *et al*., 2005; Pearson and Henryks, 2008). Chinese consumers are using a variety of strategies to cope with risk and have opted out of the conventional food channel. The certified organic food buyers rated the "does not contain genetically modified food ingredients" attribute and "improve the future health of my family" slightly higher in importance than the non-organic food buyers. The commitment to buying GMO-free food is somewhat surprising, since research suggests that Chinese consumers accept GM foods (Huang *et al*., 2006; Zhang *et al*., 2010) and GMOs are not prohibited in green foods. The study identified knowledge gaps. Around half of the sample doesn't understand the difference between green food and certified organic food. The follow-up study suggests that Chinese consumers distrust GMOs on health grounds, rather than ethical or environmental reasons. They are turning to foreign produce or buying direct from local farmers to minimize risk. We leave it to future research to confirm these findings and explore other possible explanations for the distrust of GMOs. Given that the Chinese government has embraced biotechnology, public resistance to GMOs should concern policy makers. This finding calls for intensified campaigning by the authorities. Small-scale farmers in China, however, could use consumer aversion to GMOs as a promotional tool. Chinese consumers concerned primarily with the health aspects of organic, GMO-free food rather than the environmental or social consequences will probably be receptive to imported organic food. However, the confusion of consumers and inability to distinguish semi-organic or "green" food from "certified organic" food could limit sales. The contribution of this paper

includes identifying the determinants of the adoption of 'green' innovations and contributing to the literature on sustainable food consumption. This study had its limitations, such as the small sample size, reliance on self-reported data and potential that the survey method results in socially desirable responses.

Acknowegements: The research was funded by a mid-career researcher grant from James Cook University, Townsville, Australia

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