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## CHINESE CONSUMERS' CHOICE FOR GENETICALLY MODIFIED (GM) FOOD: IMPLICATIONS FOR FOOD RISK POLICY IN CHINA

*GM food products are being marketed in China extensively; however, Chinese consumers are not still well informed on the basics of GM and the availability of GM food products. Understanding Chinese consumers' behavior towards GM products is an important step in developing effective public policy measures on food risk management and marketing strategies of GM foods. This paper compares relative importance of 3 major antecedents — product related cues, consumers' awareness cues and policy related cues. By comparing these antecedents, the paper provides guidelines on successful marketing and risk management of GM food products. Knowledge & awareness construct was found to have the largest effect on consumers' not willing to buy (NWTB) construct, and perceived risk construct had substantial secondary effect on NWTB.*

*Keywords: consumer behavior, genetically modified food, Chinese consumer, food safety.*

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## ВИБІР ГЕНЕТИЧНО МОДИФІКОВАНИХ ПРОДУКТІВ КИТАЙСЬКИМИ СПОЖИВАЧАМИ: ВИСНОВКИ ДЛЯ РОЗРОБКИ ПОЛІТИКИ ХАРЧОВИХ РИЗИКІВ

*У статті показано, що генетично модифіковані продукти харчування поширені в Китаї, проте не всі китайські споживачі інформовані про них в повній мірі. Розуміння ставлення китайських споживачів до ГМ продуктів є основою для розробки ефективної державної політики з управління харчовими ризиками і маркетингових стратегій для ГМ харчових продуктів. Порівняно відносну важливість 3 основних чинників — якості продукції, інформування споживачів і відповідної політики. Передбачено, в якому напрямі зацікавлені сторони повинні розвиватися в майбутньому для успішного маркетингу і управління ризиками генетично модифікованих харчових продуктів. Знання і обізнаність мають найбільший вплив на небажання споживачів зробити покупку, а передбачуваний ризик має вторинну дію.*

*Ключові слова: поведінка споживачів, генетично модифіковані продукти харчування, китайські споживачі, безпека харчових продуктів.*

*Таб. 3. Літ. 30.*

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## ВЫБОР ГЕНЕТИЧЕСКИ МОДИФИЦИРОВАННЫХ ПРОДУКТОВ КИТАЙСКИМИ ПОТРЕБИТЕЛЯМИ: ВЫВОДЫ ДЛЯ РАЗРАБОТКИ ПОЛИТИКИ ПИЩЕВЫХ РИСКОВ

*В статье показано, что генномодифицированные продукты питания широко распространены в Китае, однако не все китайские потребители информированы о них в полной мере. Понимание отношения китайских потребителей к ГМ продуктам питания является важной основой в разработке эффективных мер государственной политики управления пищевыми рисками и маркетинговых стратегий для ГМ пищевых*

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*продуктов питания. Сравнивалась относительная важность 3 основных факторов — качества продукции, информирования потребителей и соответствующей политики. Предполагено, в каком направлении заинтересованные стороны должны развиваться в будущем для успешного маркетинга и управления рисками ГМ продуктов. Знания и осведомленность оказывают наибольшее влияние на нежелание потребителей совершить покупку, а предполагаемый риск оказывает вторичное воздействие.*

*Ключевые слова: поведение потребителей, генетически модифицированные продукты питания, китайские потребители, безопасность пищевых продуктов.*

**Introduction.** Food safety has become an important public issue around the world, and consumers increasingly demand quality assurance and reliability in food safety management of government. Globalization and increased international trade of food products have complicated the safety of food supply in global network as it integrates food risk management systems in different countries. Particularly, the topic of genetically modified (GM) food products has come to the center of international debate for food safety and risk management, and consumers' response toward current GM products has been extensively assessed in recent years (Bredahl, 1999; Burton et al., 2001; Scholderer and Frewer, 2003; Frewer et al., 2005; Hu et al., 2004; Curtis et al., 2004; Gaskell, 1999; Hoban, 1997; McCluskey & Whal, 2003). Major food import countries expressed concerns for import of GM food products based on the negative response of consumers towards GM food products and have banned GM imports in the past. With trade liberalization, importing countries are re-evaluating risk concerns about food products sourced from high-risk countries, while the issues of food security press the need for increased trade of food products.

Production of GM food continue to expand and the total surface area of GM cultivated land increased from 4.2 mln in 1997 to 365 mln acres in 2010, contributing 10% of the world's crop (Clive, 2010). By 2010, the total of 29 countries worldwide grew GM crops by approximately 15.4 mln producers, and 75% of all processed foods in the US is reported to contain GM ingredients (Clives, 2010). Thus, it is inevitable that food import countries accept import of GM food products and recently some European countries and emerging markets have allowed partial importation of GM food products. Several studies suggested that Chinese consumers have a higher acceptance rate towards GM foods when compared with consumers in other countries (Gale et al., 2002; Li et al., 2003; Huang et al., 2002; Huang et al., 2006).

China is a major food trading country and currently allows imports of GM tomato, GM potato, GM corn and GM green pepper as well as processed food products which contain GM ingredients. Thus, GM food products are being marketed in China extensively; however, Chinese consumers are not still well informed on the basics about GM and the availability of GM food products due to recent changes. Understanding of Chinese consumers' behavior toward GM food products is an important foundation in developing effective public policy measures of food risk management and marketing strategies for GM food. This is particularly important in China as food safety and food security are highly prioritized public issues which are essential for sustainable growth of Chinese economy. This paper aims to compare rel-

ative importance of 3 major antecedents — product related cues, consumers' awareness cues and policy related cues. By comparing these antecedents, the paper attempts to provide guideline as to which direction stakeholders should take in future for successful marketing and risk management of GM food products.

**Perception of Food Safety and Food Risk Management in China.** Food safety can be defined as the opposite of food risk, i.e. as the probability of not contracting a disease as a consequence of consuming a certain food, or can be viewed as encompassing nutritional qualities of food and more wide ranging concerns about the properties of unfamiliar food such as genetically modified foods (Grunert, 2005). Food safety can be further considered in objective versus subjective context since there are certain gaps existing in how food safety is defined by experts and scientists and by the public. The notion of 'real' or 'objective' risk is challenged, arguing risk is inherently subjective (Krimsky & Golding, 1992; Slovic, 1992). Risk is a social construct which is being constantly negotiated and redefined (Fleising, 1991). Therefore, it is acknowledged that the gap between experts and public views of food safety need to be addressed with proper risk communication strategy and better consumer information and education (Frewer et al., 2005). This aspect of risk communication is emerging as an important dimension as transparency and self-participatory process of policy making by consumers are viewed as effective communication strategies. However, some researchers argue that this recommendation is based on unrealistic assumptions about consumers' willingness and ability to process information and provide their opinions on food safety policy (Grunert et al., 2005). Whether or not Chinese consumers prefer to participate in policy-making process and are able to actively search for information is yet to be empirically discovered.

Safety perceptions play a predominant role when major food safety incidents occur and risk perceptions can come to dominate all other considerations in food choice and lead consumers to avoid certain product types. In particular, consumers apply safety considerations to unfamiliar technology such as GMOs, and they develop negative attitudes towards the use of these technologies (Grunert, 2005). Consumers' attitude towards GM foods can be a major determinant in conditioning market force and policy makers and regulators recognize the significance of this factor in their risk management.

Genetically modified (GM) products are gradually entering the market while its long-term effects are not readily understood by public. Uncertainty in GM technology and credence characteristics of GM foods may cause risk perception to consumers, which may have substantial impact on their choice behavior. The dimension of dread and unfamiliarity in risk perception should be noted for public opposition to GM foods, as familiar risks are perceived by consumers as less severe than unfamiliar ones, which implies that the level of awareness and knowledge regarding GM foods may affect their risk perception. GM foods entail dread risk since food producers are the ones who decide whether to use GM ingredients in their products and consumers do not necessarily have a choice (i.e. involuntary exposure) (Melissa, 2005).

Consumer acceptance of, or resistance to, GM foods and processes depends on how the applications or their results are described (Hossain et al., 2003; Onyango and Nayga, 2004). Acceptance of GM foods may increase if specific benefits or attributes

are described. In consumers' choice making process, risk and benefit analysis may take place, affecting their overall perception on GM food products and lead to their final choice. Consumer adoption of new GM products depends on whether benefits outweigh potential risks (Bredahl, 2001; Bredahl et al., 1998). Therefore, consumers' perception of risk and benefits of GM food should be both taken into account as possible antecedents of their choice behavior.

Views and attitude towards GMOs can be divided into 3 groups: the corporate world demands free GMO research, cultivation and trade, and especially the US is the major proponent of GM food marketing given its long history of GMO research and commercialization. The US argues that GM technology enables possible solution for food security and famine worldwide. On the other hand, EU and some emerging market countries are reluctant to accept GM food products and have relatively stringent GMO legislations. GM soy imported from the US and other countries are quietly used as animal feed but at the same time, there is an active anti GMO movement and public resistance to GM food (Johan, 2009). The third group have strong negative attitude towards GMO and demand total ban on GM food marketing. New Zealand, Ireland and some Muslim countries belong to this group (Johan, 2009). China can be categorized into the first group. China has developed the largest public biotechnology sector outside North America (Huang et al., 2002). Chinese scientists have generated various ranges of GM food products and Chinese government approved a National Special Program on the Genetically Modified Crops and Livestock Breeding with funding reaching US\$3.9 bln (Zhang et al., 2010).

For food security purpose, GM food products may pose an important alternative for China, given its large population and substantive food imports. Marketing of GM foods can expand the source of food supply for certain product categories and alleviate the inflationary pressure on food price in China, which is one of the foremost economic concerns of Chinese government. Thus, GM food products may entail some economic benefits at the national level which may not be appreciated by consumers at the individual level.

Food safety and risk management have become increasingly important public policy issues in China, as series of food scandals in recent years have raised Chinese consumers' concern for food safety system in China. To improve consumers' confidence level in the public food risk management, Chinese government reformed its regulatory structure in 2009 with a new Food Safety Law, reducing the size of administrative agencies by half to increase their efficiency and effectiveness. Under the new Food Safety Law, the food certification and accreditation system has been established which connect "farm to fork" via HACCP certification. This certification is awarded against 634 mandatory food safety standards, 2100 national quality standards, and 2900 industry standards (Bi, 2009).

Chinese government attempts to reinforce the regulatory process of food safety management throughout the food supply chain, however, this has been encountered with challenges due to structural problems. Approximately 350,000 of China's 450,000 registered businesses in food production and processing employ as few as 10 people or less, which are governed by municipal governments. The extent of municipal government's regulation is not sufficiently expanding accordingly to growth of the

food processing sector, while some rural areas are neglected by the municipal government as the farm land is decreasing. This leads to increase in illegal small-sized food processors that operate their production on temporary bases, evading regulatory surveillance. Effective regulation and monitoring of food safety standards of small-scale food-processing companies is likely to be a determining factor for future success of Chinese food risk management system.

**Research Methods.** This study develops a multi-attribute model approximating Chinese consumers' choice for GM foods, which had 4 main constructs. Perceived Risk and Perceived Benefits are the 2 constructs in which consumers perceive potential risks and benefits related to GM products. Knowledge & Awareness construct is related to consumers' cognitive level of understanding about GM products. Attitude to policy makers estimates consumers' attitude to government policies in food risk management and risk communication. Having these 4 significantly different constructs in the model, the study measures the relative importance of product related issues, consumers' awareness and their trust & attitude to government for safety of GM food. Findings of this analysis provides macrooverview of which are the most important areas policy makers should focus in enhancing their food risk management and communication. Primary data has been generated with a survey method, and the survey (250 samples) was conducted in the capital city of China, Beijing in 2011.

Chinese consumers' attitudes, risk and benefit perceptions, knowledge and awareness level of GM food products and purchase intention for GM food products were all measured with multiple items using the 5-point Likert scale. To analyze the collected data, structural equation modeling (SEM) was applied which enables estimation of multiple constructs with path analysis. Confirmatory factor analysis was employed to identify performing items and to improve the model fit. The empirical model was estimated by maximum likelihood using AMOS to generate path diagram. Regarding fit statistics of the measurement model, the value of RMSEA was 0.074, and GFI = 0.912, which indicate reasonable fit of the model (Table 1).

**Results and Discussion.** Tables 2 and 3 report the estimated parameters of the proposed model. Knowledge & Awareness construct was found to have the largest effect on consumers' not willing to buy (NWTB) construct, and Perceived Risk construct had substantial secondary effect on NWTB. Other remaining 2 constructs, Attitude and Perceived Benefit had significantly smaller impact on NWTB compared to previous 2 constructs. Overall, Perceived Benefit construct had the least negative effect on NWTB (Table 2).

The findings suggest that Chinese consumers had significantly low level of Awareness on GM food risks, which lead to their willingness not to buy GM food products. Consequently, they had limited Knowledge on this subject and knowledge level did not have much impact on their purchase intentions. More active cooperation among major stakeholders, such as experts, policy makers, other middlemen in the food supply chain may be needed to raise consumers' trust and awareness of the public.

Chinese consumers' Perceived Risk of GM food products was an important determinant for their choice behavior, and their concerns for potential environmental damage and unknown health risk were identified to be the reason for their per-

ceived risk on GM food products. When consumers face the choice associated with uncertainty or perceived risk, consumers tend to develop a risk-reducing strategy as they feel anxious. Information seeking is one of the common strategies for reducing anxiety (Locander and Hermann, 1979). In this regard, developing an effective communication message to consumers regarding the safety of GM food products is critical as this can mitigate consumers' anxiety towards GM food products.

Chinese consumers were found to be concerned with the level of transparency in risk communication of GM products by policy makers. Lack of trust has been identified as a critical factor in the gap between expert and lay assessment of risk and the research suggests a direct relationship between distrust in regulatory agencies and risk perceptions (Slovic, 1997). Dialogue between stakeholders and regulators may be a partial solution in building trust in policy makers and other stakeholders. To enable such a dialogue, a legitimate governing agency should be established which then be connected to the global system operated by international agency such as the World Health Organization (WHO).

Chinese consumers consider that strict regulation of GM food products to be beneficial, and would choose domestic GM food products instead of imported non GM food products, reflecting their strong preference for domestic food products. Reduced usage of pesticides in GM food products was also found to be beneficial to consumers.

**Policy Recommendations.** The study results have shown that Chinese consumer attitudes and purchase intentions towards GM products are significantly influenced by their level of knowledge and awareness. Chinese consumers appear to have limited understanding of GM food, which hinder them from making a legitimate choice. Lack of knowledge and awareness on GM foods may lead them to perceive potential risk, which heavily affects their purchase intentions. This implies that GM products may be at the early adoption stage of product life cycle, in which effective communication strategy plays a vital role for successful GM food management at a market.

The ultimate judge of the effectiveness of food risk management is the public and consumers who are major stakeholders and end-users of GM products marketed in China. It is a government's role to communicate how decisively and effectively they are managing and regulating food risk of GM foods. Experts, scientists and policy-makers may re-evaluate transparency of their risk communication for GM foods. GM foods have distinctive credence characteristics, which may require "care communication" approach which involves various stakeholders to have 2-way communication and to elicit cooperative system for maximization of food risk information and communication. Chinese food risk management and communication system should be connected with the systems of other major trading partners.

Globalization and increase in distant sources of supply and of the varying level of competency in various functions throughout the food supply chain call for urgency in initiating an integrated food safety and risk management system among major trading partners. It is imperative that governments provide international symposium and workshop to promote knowledge transfer among the food safety community of partner countries to develop internationally recognized and coordinated network of food safety systems. This effort should be aimed to create awareness and a shared interest



in optimizing the comparable level of food safety throughout the international food supply chain.

**Table 1. Goodness-of fit**

Model	GFI	RMSEA
Default model	.912(>0.9)	.074(<0.1)
Saturated model	.000	
Independence model	.392	.226

**Table 2. Estimated Parameters for Structural Equation Model**

Dependent Latent Variable		Independent Latent Variable	Standardized Estimate
Not willing to buy	<----	Knowledge & awareness	.554
Not willing to buy	<----	Attitude toward policy maker	.019
Not willing to buy	<----	Perceived risk	.409
Not willing to buy	<----	Perceived benefit	-.015

**Table 3. Standardized Estimates of Path Coefficients**

Constructs	Independent Variables	Estimate	S.E.	C.R.	P
Attitude towards policy makers	Need to have 3 <sup>rd</sup> independent agency to manage GM products	1.000			
	Want to participate in GM policy-making process	-1.731	.686	-2.523	.012
	Transparency in risk communication	2.374	.712	3.337	***
Perceived Risk	Environmental damages	1.000			
	Unknown health risks	1.595	.118	13.553	***
Perceived Benefits	Solution for food security	1.000			
	Strict regulation on GM products	2.343	.365	6.419	***
	Reduction in pesticide usage	1.043	.176	5.922	***
	Reliability of domestic GM products	1.835	.303	6.111	***
Knowledge & Awareness	Awareness of long-term health effects of GM products	1.000			
	Awareness of GM food risks	1.610	.161	10.029	***
	Knowledge of GM foods	-.445	.116	-3.845	***
	Knowledge of GM technology	-.106	.104	-1.019	.308
<b>Dependent Variables</b>					
Not Willing To Buy (NWTB)	Must label GM food products	1.000			
	Not willing to buy GM food product	1.254	.112	11.180	***

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