

ABSTRACT

Genetically modified (GM) rice has been developed to confer pest resistance, herbicide tolerance and health benefits, yet regulatory, policy and market barriers have prevented GM rice commercialization. The purpose of this study is to understand the barriers of GM rice acceptance in China based on a large scale consumer survey.

Semi-double bounded dichotomous choice (DBDC) contingent valuation and multinomial logistic maximum likelihood models are estimated to measure the willingness to pay (WTP) with regards to consumer attitudes towards different GM rice products.

This survey covered 13 provinces, three municipalities, and 55 cities. The total sample size was 994 consumers.

Results show similarities and differences with previous research. Model estimates imply significant differences between WTP across information treatments, with respect to the level of objective and subjective knowledge, the effect of socio-economic and demographic variables, and the importance of conveying benefit and risk information. More balanced information is needed to achieve mass acceptance and approval by China's consumers. The study informs policy decision-makers, bioscience companies and researchers with regard important factors that need to be addressed to achieve broad public and commercial acceptance of GM rice.

INTRODUCTION

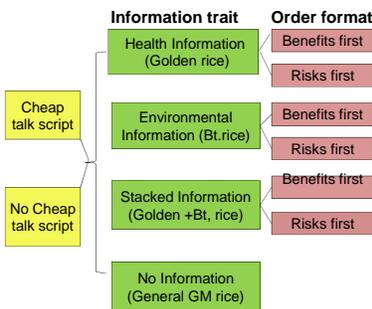
China's GM rice development

Increased government support for GM rice research has occurred. Trial Research Biosafety Certification has been issued in 2009.

Purpose of this research

To update our understanding about Chinese consumers' attitudes and their willingness to pay (WTP) for GM rice based on science-based GM information treatments. We test the value of 'cheap talk' script to control hypothetical bias. Results are compared with previous studies of Chinese consumers' WTP and attitudes towards GM rice.

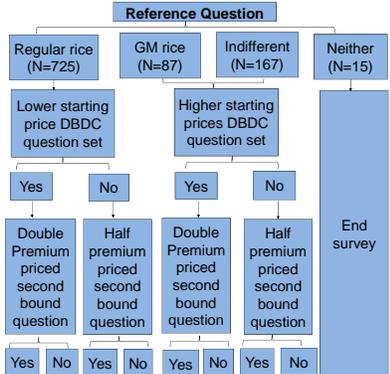
Survey Design:



METHODOLOGY

Semi DBDC question design:

A reference price question is asked after the information and cheap talk treatments. This question offers a reference price of 5 Yuan/ kg for non-GM and GM rice and elicited the basic preference of consumers. According to subjects' response to this reference question, they will then be assigned to different DBDC questions.



DBDC parameters were estimated in STATA following the procedure by Lopez-Feldman¹

RESULTS

Table 1. Objective Knowledge in China compared to previous studies. True/false (T/F) questions (% correct)

	This study ²	China 2002 ²	U.S 2001 ³	EU 1999 ⁴
1. Bacteria live in waste water	T 95%	93%	94%	83%
2. Father's gene defines gender of child	T 62%	59%	73%	44%
3. Ordinary food does not contain genes, GM food does	F 72%	43%	57%	35%
4. Eating GM food modifies consumer's genes	F 59%	53%	69%	42%
5. Gene transfer between animals and plants is impossible	F 47%	26%	48%	26%
6. GM product with genes from fish would taste "fishy."	F 41%	29%	48%	NA

Table 2. WTP for GM Rice by Information Treatments

Trait	Lower Starting Prices		Higher Starting Prices	
	Yuan/kg	Premium	Yuan/kg	Premium
Mean	1.60	-68%	5.72	14%
Neutral trait	1.83	-63%	5.62	12%
Health trait	0.91	-82%	4.96	-1%
Environmental trait	1.69	-66%	6.07	21%
Stacked trait	1.33	-73%	6.23	25%

DISCUSSION

With no price difference, 73% of the consumers preferred non-GM compared to GM rice. Objective knowledge in China about GM has improved. Consumers with a higher education level (bachelor degree) and those who received the health information treatment with a benefit-risk information order were more likely to choose non-GM rice rather than GM rice. Respondents from large cities and rural town had higher acceptance toward GM rice (Table 2). No statistical difference in WTP was found among information treatments. Consumers are segmented into 2 groups based on the reference question. Variables that significantly altered WTP responses are presented in table 4 for those who preferred non-GM and table 5 for those who preferred GM rice. The results show that consumers' WTP for GM rice for the entire sample was estimated to require an average 47% price discount for GM rice. This is a significant change from earlier studies⁶. Science-based knowledge about GM rice benefits and risks need to be intensively disseminated to China's consumers to improve acceptance and successful commercialization.

MERS (marginal effect at representative values) were computed using a M-LOGIT model to obtain the overall effect of the factor variables and illustrate intuitively meaningful results. For example, respondents who had a bachelor's degree are 7.5% more likely to choose non-GM rice, 3.3% less likely to choose GM rice; 4.2% less likely to choose indifferent when both rice products price at 5 yuan/kg. The other variables are interpreted similarly.⁵

Table 3. Multinomial logistic and MER reference questions

Variables	Non-GM rice%	GM rice%	Indifferent %	Neither %
Bachelor's degree	7.5***	-3.3*	-4.2*	0.2
Cheap talk	4.5*	-1.9	-2.9	0.3
Information and order (Base=No information)				
Health benefit-risk	8.8**	-5.4*	-2.4	-0.1
City size(Base=Mid-size)				
Large	-1.2	7.1**	-5.2	-0.7
Small	0.04	6.9***	-5.4*	-1.5**
Administrative divisions(Base=Capital city)				
Second level city	-16.3***	4.9*	9.8***	1.5*
Town	-9.9***	6.0***	3.9	0.1
Village	-14.2***	4.8	7.5*	1.9
Media reliability	-5.7**	2.9*	2.8	0.03

* 10% significance, ** 5% significance, *** 1% significance

Table 4. Lower starting prices DBDC analysis

Variables	Coef.
Respondent has a Bachelor's degree*	-0.56
Household size*	-0.24
Household Income ***	-0.07
Number of meals with rice*	-0.48
Purchase rice once a month**	-0.78
Current rice stock<5kg***	-0.99
Current rice stock 5kg-10kg	-0.5
Heard of Hybridization***	-1.36
Heard of Biotechnology***	-0.99
Heard of GMO*	-0.3
Good subjective knowledge of GM rice*	-0.86
Ave. subjective knowledge of GM rice*	-0.75
Willing to accept (WTA) GM soybean oil**	0.74
WTA GM corn-fed livestock***	1.21
WTA GM pest resistance rice	0.44
WTA health-enhanced GM rice***	1.09

* 10% significance, ** 5% significance, *** 1% significance

Table 5. Higher Starting price DBDC analysis

Variables	Coef.
Age of respondent**	0.03
Respondent has monthly salary**	-0.73
Household income ***	0.05
Objective knowledge accuracy **	2.74
Heard of golden rice case in 2012**	0.87
Rely on TV and radio for food news*	-0.61

* 10% significance, ** 5% significance, *** 1% significance

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