# Willingness to Accept and Purchase Modified Rice with High Folate Content

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## Abstract

Neural-Tube Defects, the most common congenital malformation, is closely related to low maternal folate intake. As the Chinese Shanxi Province has one of the highest prevalence rates of Neural-Tube Defects, folate fortification of rice is an excellent alternative to low intake of folate acid pills.
This paper analyses the relations between socio-demographic indicators, knowledge, consumer perceptions, willingness-to-accept and willingness-to-pay genetically modified rice in Shanxi Province.
Using standardised questionnaires the survey compromises 944 interviews with Shanxi rice consumers. Multivariate analyses consist of multinomial logistic regression, multiple regression and cluster analysis. The results indicate that consumers generally are willing to accept GM rice, with an acceptance rate of 62,2 %. Acceptance is influenced by objective knowledge and consumer' perceptions on benefits and risks, while willingness-to-pay GM rice is determined by objective knowledge, risk perception and acceptance.
Cluster analysis reveals a three cluster segmentation into three clusters: enthusiasts (14,2 %), opponents (44,6 %) and cautious (41,2 %). The enthusiasts are characterized by significantly more objective knowledge and a more positive perception towards safety, benefits and risks. The opponents have lower objective knowledge and less positive safety and risk perceptions, while cautious consumers perceive benefits and price impact more negative. Significantly more enthusiasts accept GM rice and are more willing to pay for it than opponents. The cautious are significantly more indifferent and have an intermediate position about purchase intention.
Communication towards the use of GM rice should target mainly on improving knowledge and consumers' perceptions, and in particular towards the opponents.

## Abbreviations

GM: Genetically Modification
GMF: Genetically Modified Food
GMR: Genetically Modified Rice
NTD: Neural-Tube Defects
WTA: Willingness-to-accept
WTP: Willingness-to-purchase

## Introduction

One-third of stillbirths and infant mortality in China are characterized by a Neural-Tube Defect (NTD), the world's most common congenital malformation (Li et al. 2006; Li et al. 2007). Shanxi, a poor province in North China, has one of the highest prevalence rates of NTDs in the world (Li et al. 2006; Li et al. 2007). Periconceptional use of folic acid multivitamins can reduce a woman's risk of having a baby with a NTD (Berry et al. 1999). Unfortunately, the use of folic acid pills is not well established in poor regions such as Shanxi Province (Li et al. 2007). Biofortification, breeding staple food crops for micronutrients, can be considered as an excellent alternative in such regions (Bekaert et al. 2008)

Because rice is China's major staple crop, but a poor source of folates (Vitamin B9), folic acid fortification of rice can increase folate intake in less developed regions. High folate rice was recently obtained by metabolic engineering (Storozhenko et al. 2007). Regarding the world leading position of China in the production of Genetically Modified (GM) rice (Huang et al. 2004), commercializing this kind of GM rice production in the poor Shanxi Province could be the answer to the high NTD's and low intake of folic acid pills.

To guarantee effective implementation, consumer's acceptance towards GM rice is necessary. Therefore, the purpose of this paper is to justify the potential of GM rice in Shanxi Province by analyzing willingness-to-accept (WTA) and willingness-to-purchase (WTP) GM rice and its determinants. Furthermore, segmentation analysis is conducted to underpin future communication strategies.

## Conceptual framework

The conceptual framework (Figure 1) to explore acceptance and purchase intention of GM rice is based upon evidence from published papers on two complementary approaches of consumer acceptance and purchase intention (Bonti-Ankomah & Yiridoe 2006; Costa-Font et al. 2008). The most important consumer characteristics that influence WTA and WTP GM rice are included. Questions related to objective knowledge, consumer perceptions and acceptance of GM food are only applied to consumers who believe to know what GM food is (subjective knowledge).

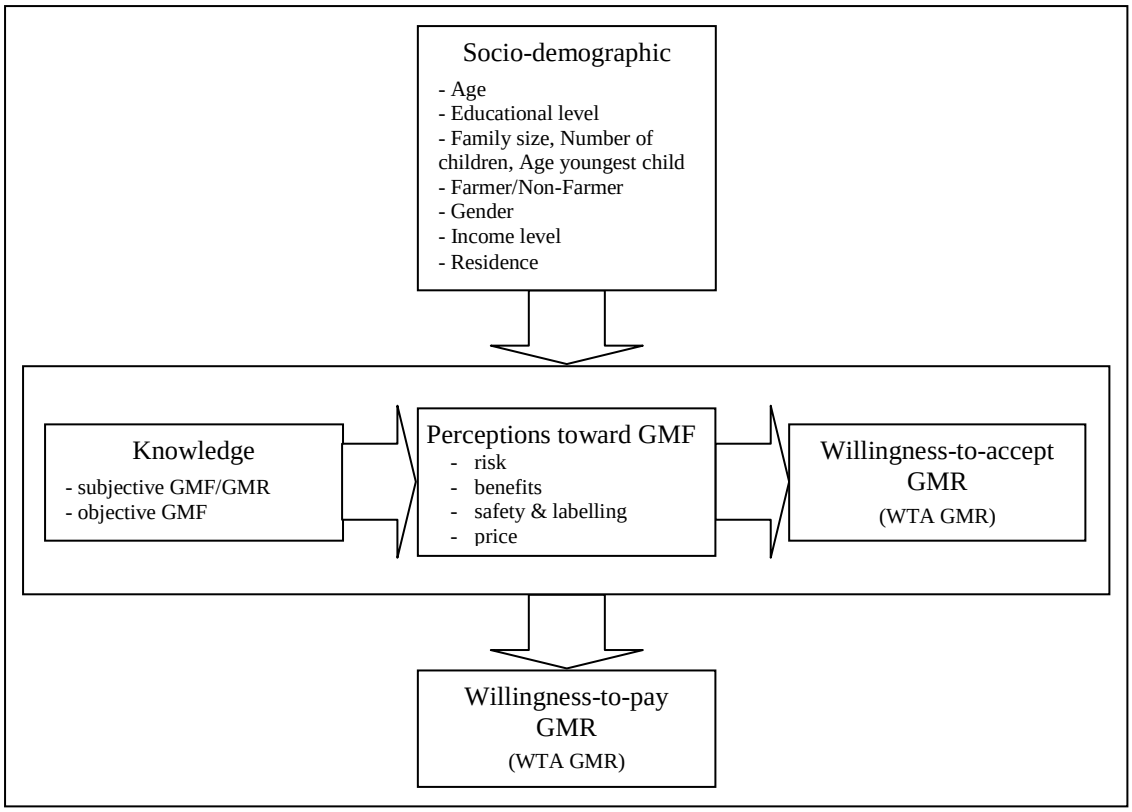


**Figure 1. Theoretical framework of consumer acceptance and purchase intention of GM rice**

Many authors state that *socio-demographic variables* (alone) do not have a strong explanatory power to predict acceptance of GM food products (Bredahl et al. 1998; Li et al. 2002; Ganiere et al. 2006; Kontoleon and Yabe 2006; Anand et al. 2007; Wachenheim et al. 2008). Nevertheless, based on scientific evidence, the following socio-demographic indicators are included: age, education, family-related indicators (family size, number of children and age of the youngest child), gender, income and residence (rural/urban). Farmer status (farmer/non-farmer), is added because farmers operate on both supply and demand side for rice consumption.

*Knowledge* is one of the most important determinants of WTA and WTP GM food. Because previous studies indicate that objective knowledge of GM food is significant lower than subjective knowledge (Li et al. 2002; Verdurme et al. 2003; Ganiere et al. 2006; Ho et al. 2006; Costa-Font et al. 2008), both components are included. With respect to GM rice, only subjective knowledge of GM rice is questioned.

*Consumer perceptions* regarding GM food products differ across countries and between products (Costa-Font et al. 2008) and are assumed to be important determinants of acceptance (Bredahl et al. 1998; Li et al. 2002). Analogues to previous research (Bredahl et al. 1998; Verdurme et al. 2003; Pope et al. 2004), this paper used a multi-item scale of four consumer's perceptions (risks, benefits, safety and price impact).

The last decade, *willingness-to-accept* GM food received a lot of attention in scientific literature (Li et al. 2004; Lusk et al. 2005; Costa-Font et al. 2008). GM food acceptance is complex and differs across cultures and countries. In European and other developed countries, except for the United States, GM food acceptance is largely negative (Gaskel et al. 1999; Magnusson and Koivisto Hursti 2002). In lesser developed countries however, there is less reluctance and acceptance is often higher (Huang et al. 2006; Anand et al. 2007). China is an interesting case, as it is the world leader in GM crop production and consumption. Several

studies on Chinese consumer acceptance indicate positive attitudes towards GM food (Lin et al. 2004; Ho et al. 2006; Anand et al. 2007).

*Willingness-to-purchase* is often measured by asking whether consumers want to pay/receive a premium/discount for a GM food product (Bonti-Ankomah and Yiridoe 2006; Ganiere et al. 2006; Anand et al. 2007). Analogous to WTA, WTP differs across countries and between products. In general, consumers want to pay more for non-GM food products, which does not imply resistance to GM food. Chinese and Indian consumers for instance are willing to pay a premium of respectively 19.5 % and 38 % for Golden Rice (Li et al. 2002; Deodhar et al. 2008).

Both acceptance and purchase intention of our GM product, folate fortified rice, refer to a behavioural intention, because the product is still in a testing stage.

## Methodology

The study was conducted in the Chinese Shanxi province, in particular the city Taiyuan, three counties (Mingxing, Houcheng, and Beiwang) and ten villages. Surveillance data of Li et al (2006) indicates that the overall birth prevalence of Neural-Tube Defects (NTD) in this province is one of the highest of the world, with more than 10 per 1000 births. Because an NTD risk is associated with low folate intake (Vitamin B9) and because rice is China's major produced and consumed staple crop, but low in folate content, a folate fortified rice variant (Storozhenko et al. 2007) can be considered as an excellent case to tackle the high prevalence of NTDs in Shanxi province.

The standardized questionnaire consists of four parts. The first section focuses on information on consumer's knowledge of GM food and rice. The second section explores two main concepts: consumer perceptions are covered by a series of statements about beliefs on benefits (7 statements), risks (4), safety (4) and price (2), and WTA GM rice is measured on a 5 point Likert scale, which is recoded into 3 categories (yes, indifferent, no). The third section collects information about purchase intention of GM rice for consumption. The questionnaire ends with the socio-demographic profile of the respondent, based on nine indicators.

The consumer survey compromises random face-to-face interviews with rice consumers from Shanxi Province, China. A total of 944 complete questionnaires were used for the analysis. Data were entered and analysed using the statistical package SPSS (version 15). Reliability analyses were used to validate an overall objective knowledge score, the statement categories of consumer perceptions and WTA GM food. Paired Sample t-test were used to compare categories of consumer perceptions.

Relations within the conceptual framework are analysed by three statistical tests. First, the $\chi^2$-test is used to assess the statistical significance and strength of association of two cross-tabulated categorical variables. Second, Analysis of Variance (ANOVA) is used as a test of means of the metric variables for two or more populations. Post Hoc Sheffe tests are performed to define which categories are responsible for a significant difference. Third, simple regression analysis is used to explore the relation between two metric variables.

On multivariate level, multinomial logistic, multiple regression and cluster analysis were used. Multinomial logistic regression is used to compare three GMR acceptance groups through a combination of binary logistic regressions. The causality between one independent metric variable and potential predictor variables is determined by multiple regression. Finally, hierarchical cluster analysis with Ward's procedure is applied to classify respondents into relatively homogenous groups based on selected variables (Malhotra 2004).

## Results and discussion

*Sample characteristics*

The *socio-demographic* characteristics of the sample are presented in Table 1. The total sample of 944 respondents is considered indicative for Shanxi Province. For instance, the high poverty rate of this region is reflected in the asymmetric frequencies of education and income. Because the target group consists of consumers responsible for rice purchase, there is no respondent aged below 20 years. About 5 % of the respondents are illiterate. Residence is controlled to have an equal representation of respondents living in rural or urban areas.

**Table 1. Socio-demographic characteristics of the sample (% of respondents, n=944)**

| | Variable | Categories | % | | Variable | Categories | % |
|---|---|---|---|---|---|---|---|
| **General** | Age | 20-29 years | 16.5 | **Family related** | Family Size | ≤2 | 7.0 |
| | | 30-39 years | 29.3 | | | 3 | 40.8 |
| | | 40-49 years | 30.4 | | | 4 | 29.8 |
| | | 50-59 years | 16.7 | | | >4 | 22.5 |
| | | >59 years | 7.0 | | Number of Children | none | 11.1 |
| | Education[a] | Illiterate | 5.1 | | | 1 | 41.7 |
| | | Low | 66.8 | | | 2 | 31.4 |
| | | High | 28.1 | | | >2 | 15.8 |
| | Gender | Male | 47.5 | | Age Youngest Child | none | 11.1 |
| | | Female | 52.5 | | | <3 | 7.0 |
| | Income[b] | Low | 92.8 | | | 3-10 | 22.0 |
| | | High | 7.2 | | | >10 | 59.9 |
| | Residence | Rural | 50.2 | **Other** | Farmer Status | Farmer | 20.7 |
| | | Urban | 49.8 | | | Non-Farmer | 79.3 |

[a] low: primary or secondary school; high: college or university
[b] low: yearly income ≤ 40000 Yuan; high: yearly income > 40000 Yuan

Subjective *knowledge* of GM food is more or less equally divided among the sample: 47.8 % of the consumers are aware of GM food. This is about 20 % lower than what Huang et al (2006) found in urban China. Objective GM food knowledge, based on six reliable true-or-false statements ($\alpha>0.6$), is even lower, with a mean score of 39.2 %. As stated in the Chinese study of Li et al. (2002), this reveals misjudgement of subjective GM food knowledge. With respect to GM rice, perceived knowledge is significantly lower (26.4 %) than for GM food.

*Consumer perceptions* toward GM food are characterized by 5-point Likert scale statements, related to four topics: benefits, risks, safety and price impact. After reliability analysis ($\alpha>0.6$), means are analysed for each topic. The four categories are evaluated as slightly positive, with perceptions on safety of GM food significantly more positive (Paired Sample t-test, $p<0.001$). Specific statements such as health improvement (benefits), worthiness of trying (risks), labelling (safety) and cost reduction (price) are considered most positive within their statement category. Consumers are less enthusiastic about the benefit of GM food in reducing poverty. Moreover, GM food is often considered as a threat to biodiversity with dangerous side-effects. The health benefits of GM food, which are directly related to folate fortified rice, are positive evaluated.

Most of the Shanxi consumers, 62.2 % of the respondents, are willing to accept GM rice, while 26.6 % react indifferent and 11.2 % are reluctant. Similar results are obtained in the Chinese study of Huang et al. (2006).

The average price consumers are *willing to pay* for one kg GM rice is 4.0 Yuan or approximately 0.5 euro. This is significantly more than the average price of conventional rice (3 Yuan). Comparison of both prices demonstrates that 79.2 % is willing to pay more for GM

rice, with a surplus ranging from 0.10 Yuan to 8,75 Yuan. Other consumers prefer a discount (9.9 %), ranging from 0.10 Yuan to 1.55 Yuan, or are satisfied with an equal price (10.8 %).

*Significant relations between socio-demographic indicators, knowledge, consumer perceptions, WTA and WTP GM rice.*

This section gives an overview of the main relations between the concepts of the conceptual framework. It is important to mention that objective knowledge and consumer perceptions of GM food only apply to consumers that have subjective knowledge of GM food.

Objective GM food *knowledge*, the most reliable knowledge component, is significantly higher when the respondent is female, a non-farmer, highly educated (Costa-Font et al. 2008), has a high income (Lin et al. 2004; Wachenheim et al. 2008), lives in an urban area or has a small family. Objective knowledge is positively related to the four consumer perception categories and WTP GMR. Objective knowledge is lower when people are indifferent to accept GM rice.

With respect to *consumer perceptions*, the benefits of GM food are perceived more positive by respondents older than 50 years, with a large family or living in a rural area. Safety issues are more positively evaluated by females, consumers with a high education or income level, non-farmers and urban consumers. Farmers are significantly more positive towards the price impact of GM food than non-farmers. Risk perceptions are positively related to WTA and WTP. Safety beliefs and price impact have respectively a positive and negative relation with respect to WTP. Perceptions on safety are more positive if the respondent is not indifferent to GMR.

Significantly more males, higher educated people and "rural" consumers are *willing to accept* GMR, which confirms previous research (Magnusson and Koivisto Hursti 2002; Verdurme et al. 2003; Lin et al. 2004).

The premium consumers are *willing to pay* for GM rice, is significantly higher when the respondent is a non-farmer, has a high education or income level, or is childless. Although more male or "rural" consumers are in favour of GM rice, female or "urban" consumers are willing to pay more for it.

*Explaining WTA and WTP GM rice*

The dependent variables, WTA and WTP GMR, are analysed at multivariate level by multinomial logistic and multiple regression analysis respectively. The multinomial logistic regression compares the three groups of WTA GMR (yes/indifferent/no) through a combination of binary logistic regressions. It analyses relationships between a non-metric dependent variable, WTA GMR, and metric or dichotomous independent variables. Therefore 'age' is dichotomised with 40 years as threshold.

The multinomial logistic regression model of GMR acceptance shows a model that fits significantly better than the null model. The Likelihood Ratio tests in Table 2 reveal significant relationships between WTA GMR and gender, age, education level, farmer status, objective GMF knowledge, and consumer perceptions on benefits and risks. The parameter estimates show the prediction of the probability that a respondents belongs to another category than the reference category. As WTA GMR consist of three categories, "no" is taken as reference category for "yes" (Yes vs No), "no" is taken as reference category for "indifferent" (Indifferent vs No), while "indifferent" is the reference in the comparison between "yes" and "indifferent" (Yes vs Indifferent).

Males and consumers younger than 40 years old are more willing to accept rice than being respectively indifferent or reluctant (reference categories). Having a low education level

increases the probability of being indifferent to GM rice compared to acceptance. Furthermore, farmers are more likely to be in the group of respondents who are willing to accept GM rice (indifferent/yes), rather than in the group of respondents who are reluctant.

Consumers with a high objective knowledge score are significantly more positive or negative. In other words, consumers that know less about GM food are more indifferent to GM rice.

Two statement categories of consumer perceptions influences WTA GMR. Consumers with a positive perception on GMF benefits are significantly more likely to be in the group that accepts or is indifferent to GM rice. Regarding risk perceptions, the more positive a consumer evaluates the risks of GM food, the more likely he will be accepting GM rice instead of being indifferent to it.

Multinomial logistic analysis supports previous research where acceptance of GM food is determined by knowledge and consumer's perceptions, which in turn are linked to socio-demographic characteristics (Bredahl et al. 1998; Verdurme et al. 2003).

**Table 2. Determinants of WTA GMR by Multinomial Logistic Regression**

| | | Likelihood Ratio tests | | Parameter estimates | | |
|---|---|---|---|---|---|---|
| | | $\chi^2$ | p | B | p | category vs reference category |
| **Socio-demographic indicators** | Age (dummy) | **10.61** | 0.005 | **1.75** | 0.003 | Yes vs No |
| | Education | **9.78** | 0.044 | **-0.71** | 0.033 | Yes vs Indifferent |
| | Family size | 9.56 | 0.145 | | | |
| | Number of children | 3.54 | 0.472 | | | |
| | Age youngest child | 4.73 | 0.317 | | | |
| | Farmer status | **7.84** | 0.020 | **1.83** | 0.016 | Indifferent vs No |
| | | | | **1.71** | 0.015 | Yes vs No |
| | Gender | **6.90** | 0.032 | **1.21** | 0.010 | Yes vs Indifferent |
| | Income | 0.01 | 0.997 | | | |
| | Residence | 1.43 | 0.489 | | | |
| **Knowledge** | Obj. kn. GMF | **11.74** | 0.003 | **-2.19** | 0.029 | Indifferent vs No |
| | | | | **2.25** | 0.001 | Yes vs Indifferent |
| | Subj. kn. GMR | 3.07 | 0.216 | | | |
| **Consumer perceptions** | Benefits | **5.93** | 0.051 | **1.01** | 0.022 | Indifferent vs No |
| | | | | **0.83** | 0.032 | Yes vs No |
| | Risks | **6.31** | 0.043 | **0.80** | 0.013 | Yes vs Indifferent |
| | Safety | 1.53 | 0.466 | | | |
| | Price | 0.60 | 0.739 | | | |
| **Model** | | 102.03 | 0.001 | | | |
| **Pseudo $R^2$ (Nagelkerke)** | | 0.25 | | | | |

The multiple regression model of WTP GMR ($R^2$: 0.2) shows that objective knowledge, risk perception and WTA GMR have a significant positive influence, while consumer perception on the price impact negatively affects purchase intention. The explained variance of the model increases to 46,6 % when farmers are analysed separately (Table 3). For this particular group, willingness-to-pay GM rice is significantly influenced by income and residence. Farmers with a low income or living in rural areas are less willing to purchase this product than other farmers. Non-farmers' WTP is more determined by the consumers' perception on the risks and price impact of GM food. Non-farmers are more willing to pay for GM rice if they have a less negative perception on the risks of GM food. Furthermore, non-farmers that perceive the price impact of GM rice more negatively, are willing to pay more for GM rice. This may be due to the fact that non-farmers expect higher prices for GM rice.

**Table 3. Determinants of WTP GMR by Multiple Regression for farmers versus non-farmers**

| | | Farmers | | Non- Farmers | |
|---|---|---|---|---|---|
| | | β | p | β | p |
| **Socio-demographic indicators** | Gender | -0.09 | 0.576 | -0.12 | 0.325 |
| | Age | 0.18 | 0.326 | 0.14 | 0.116 |
| | Family size | 0.02 | 0.939 | 0.03 | 0.700 |
| | Number of children | -0.28 | 0.165 | -0.12 | 0.254 |
| | Age youngest child | 0.24 | 0.096 | -0.03 | 0.779 |
| | Education | 0.07 | 0.624 | 0.00 | 0.995 |
| | Income | **0.26** | 0.011 | -0.03 | 0.545 |
| | Residence | **-0.52** | 0.001 | -0.23 | 0.069 |
| **Knowledge** | Obj. kn. GMF | 0.23 | 0.065 | 0.11 | 0.067 |
| | Subj. kn. GMR | 0.04 | 0.763 | -0.03 | 0.591 |
| **Consumer perceptions** | Benefits | 0.06 | 0.566 | 0.04 | 0.481 |
| | Risks | -0.06 | 0.554 | **0.16** | 0.008 |
| | Safety | 0.01 | 0.947 | 0.07 | 0.246 |
| | Price | -0.21 | 0.078 | **-0.18** | 0.001 |
| **WTA** | WTA GMR | 0.01 | 0.929 | 0.10 | 0.062 |
| **$R^2$** | | **0.466** | | **0.143** | |

In accordance with previous literature (Verdurme et al. 2003; Ganiere et al. 2006; Huang et al. 2006), knowledge of GM food, especially objective knowledge, is an important determinant of WTA and WTP. The results are in line with Chinese studies on acceptance (Lin et al. 2004; Ho et al. 2006) or willingness-to-pay (Li et al. 2002) GM food products. Furthermore, acceptability is higher when the benefits and the risks of GM food are more positively evaluated, which is also found in other GM food studies (Bredahl et al. 1998; Verdurme and Viaene 2001; Lusk et al. 2005). Even though many studies conclude that socio-demographic variables (alone) do not have a strong explanatory power to predict acceptance of GM food products (Bredahl et al. 1998; Li et al. 2002; Ganiere et al. 2006; Kontoleon and Yabe 2006; Anand et al. 2007; Wachenheim et al. 2008), it is still important to look for socio-demographic differences, especially when the GM food product is targeted towards specific groups. The significant relations between gender, education and WTA GMR gives an indication that special attention should be given to female low educated consumers.

Willingness-to-purchase GM rice is positively influenced by consumer perceptions on risks, but negatively by the price impact of GM rice. Furthermore, residence influences WTP in that rural consumers are willing to pay more for GM rice. These results underpin previous GM food studies (Li et al. 2004; Lusk et al. 2005; Costa-Font et al. 2008).

*Consumer segments related to GM rice acceptance and purchase intention*

To define consumer segments that differ on important consumer characteristics, a hierarchical cluster analyses is applied using Ward's clustering procedure. The selected variables are objective knowledge, consumer perceptions and WTA GM food. Therefore, the dataset is limited to respondents that know what GMF is (subjective knowledge).

**Table 4. Cluster characteristics between respondents with subjective knowledge related to GMF, significant differences between three clusters.**

| | | *Enthusiasts* | *Opponents* | *Cautious* | Statistics |
|---|---|---|---|---|---|
| **Socio-demographic** [a] | Gender | Female | Male | Female | 17.75*** |
| | Age | Old | Old | Young | 9.15** |
| | Education | Low | Low | High | 16.84*** |
| | Income | High | Low | High | 10.87** |
| | Farmer status | Non-Farmer | Farmer | Non-Farmer | 43.42*** |
| | Residence | Urban | Rural | Urban | 46.71*** |
| **Knowledge** | Obj. GMF [b] | High | Low | Medium | 31.84*** |
| | Subj. GMR [a] | No | Yes | Yes | 27.83*** |
| **Consumer perceptions** [b] | Safety | High | Low | Medium | 135.60*** |
| | Benefits | High | Medium | Low | 67.64*** |
| | Risks | High | Low | Medium | 55.64*** |
| | Price | Low | Medium | Low | 7.07** |
| **WTA** | GMF [b] | High | Medium | Medium | 42.20*** |
| | GMR [a] | Yes | Indifferent | No | 16.63** |
| **WTP** [b] | GMR | High | Medium | Medium | 7.38** |

* p<0,05 ; ** p<0,01 ; *** p<0,001
[a] Chi²-test, to test differences in a categorical variable; [b] One-way Anova, to test differences in a continuous variable

Cluster analysis reveals a segmentation into three clusters: enthusiasts (14.2 %), opponents (44.6 %) and cautious (41.2 %). The enthusiasts are characterized by significantly more objective knowledge and a more positive perception towards safety, benefits and risks. The opponents have low objective knowledge and less positive perceptions of safety and risks, while cautious consumers are characterized by more negative perceptions of benefits and price impact of GM food. Thus, cautious reticence refers to benefits and price impact, while the opponents' doubts are more related to the primary conditions of GM food, i.e. safety and risks.

Regarding willingness-to-accept and willingness-to-pay, significantly more enthusiasts accept GM rice and are more willing to pay for it than opponents. The cluster with cautious respondents represents significantly more indifferent consumers that are less willing to pay for GM rice than enthusiasts. Comparing to opponents, the price cautious consumers are willing to pay is higher but not significant.

With respect to the socio-demographic profile, opponents are significantly more represented by males, consumers with low income/education, farmers and rural consumers. Enthusiasts and cautious consumers are significantly more represented by females, consumers with a high income, non-farmers and urban consumers.

## Conclusions

There is a potential to introduce folic acid fortified rice in Shanxi Province. This statement is underpinned by the results of a consumer survey, which reveals a high acceptance rate (62.2 %) on the one hand and an even higher proportion of the consumers willing to pay a premium for GM rice (79.2 %) on the other. Acceptance and purchase intention of GM rice are positively influenced by objective knowledge and consumer' perceptions. The socio-demographic indicators play a role in influencing these concepts, especially as a determinant of knowledge.

Folate fortified rice is primarily intended for women in order to reduce the risk of having a baby with a NTD. To guarantee the success of GM rice, willingness-to-accept and willingness-to-pay have to be considered as a first step. Although less Shanxi women are willing-to-accept GM rice than men, they are more informed about GM food and are willing to pay more for this rice. The classification of the Shanxi rice consumers into three clusters

(enthusiasts, cautious consumers and opponents) shows that a segmented communication strategy is needed. A marketing strategy to convince opponents, generally characterized by a low socio-economic status, should be based on improving GM food knowledge and changing negative safety perceptions. In other words, an effective campaign has to take into account both socio-demographic differences and the determinants of WTA and WTP GM rice.

Although the results are promising, research is still needed to measure the feasibility of GM rice production and distribution in terms of cost-effectiveness.

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