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Consumers' Awareness of Genetically Modified Food and Their Willingness to Buy in Yanbian Prefecture

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Abstract Having a clear understanding of consumers' awareness of genetically modified food and their willingness to buy, plays a very important role in formulating the regulatory policy of genetically modified food and regulating the market of genetically modified food. This paper takes the supermarket consumers as the study object. Through on-site questionnaire survey, we find that consumers' awareness of genetically modified food is not high in Yanbian Prefecture, and their willingness to buy is also low; the prices of genetically modified food, consumers' income, educational level and so on, are the main factors that affect the willingness to buy. Based on this, we put forth the relevant recommendations: increasing publicity efforts to safeguard consumers' right to know and choose; increasing supervision efforts to improve the existing regulatory system of genetically modified food; actively organizing forces to carry out the study on safety of genetically modified food.

Key words Genetically modified food, Awareness, Willingness to buy, Consumers in Yanbian Prefecture

Genetically modified foods (GM foods, or biotech foods) are foods derived from genetically modified organisms. Genetically modified organisms have had specific changes introduced into their DNA by genetic engineering techniques. These techniques are much more precise than mutagenesis (mutation breeding) where an organism is exposed to radiation or chemicals to create a non-specific but stable change. Other techniques by which humans modify food organisms include selective breeding; plant breeding, and animal breeding, and somaclonal variation. Since genetically modified food has been introduced into supermarkets, there has been much controversy as to whether it is actually safe. *Genetically Modified Food Hygiene Control Regulations* in China defines the genetically modified food as follows: the food and food additives produced from animals, plants, and microorganisms whose genome composition is changed using genetic engineering technique. Genetically modified food may bring huge economic and social benefits for human being, but may also pose potential risks and threats to human health and ecological environment. Therefore, consumers' attitude towards genetically modified food is a universal concern. Although genetically modified food has come out for nearly 20 years, consumers' attitude towards genetically modified food is different.

In recent years, domestic scholars have achieved many research results on consumers' awareness of, attitude towards and willingness to buy genetically modified food. The survey of Xuan Ya'nan and Zhou Shudong (2002) shows that most people claim that they have some knowledge of genetically modified agricultural products, but in fact most of them do not really know, and some people only have heard of the word "Geneti-

cally Modified". Through the form of telephone survey, Zhong Funing *et al.* (2004) conduct a case study of consumers in Nanjing City, and the results show that the vast majority of consumers know very little about GM technology and genetically modified food; the number of people having heard of genetically modified food accounts for 43.33% of the total number of people; some people even do not know the current international controversy on the safety of genetically modified food. Through questionnaire survey of 1 000 consumers in Beijing's supermarkets, Wang Yuqing and Xue Dayuan (2005) find that 64.9% of the consumers do not well know or do not know at all the genetically modified organisms and products, and only 2.3% of the consumers well know the genetically modified food. Yan Gongcui and Qin Xiangdong (2006) take residents in Shanghai City as samples and conduct analysis on consumers' awareness of, attitude towards and willingness to buy genetically modified food and the influencing factors; the conclusion drawn is that consumers' awareness of genetically modified food is still very low. Hu Hao, *et al.* (2006) conduct survey and find that with improvement in the consumers' educational level, fewer and fewer consumers will choose genetically modified food. Fan Liyan, *et al.* (2010) believe that the mark situation of genetically modified food in the market is chaotic; more than 70% of foods have no mark of "whether it is genetically modified food"; 76.0% of respondents do not know whether there are laws and regulations for managing genetically modified agricultural products. Wang Ruidong, *et al.* (2010) use the survey data on consumers' awareness of genetically modified food in Wuhan City to analyze the factors influencing the consumers' awareness and acceptance of genetically modified food, and the results show that the educational level has significant impact on consumers' awareness of genetically modified food and the impact of other factors on consumers' awareness of genetically modified food is not obvious; consumers' gender and age have a significant effect on consumers' acceptance of genetically

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modified food.

From the above analysis, we can see than although there are many achievements on the research of consumers' attitudes and influencing factors at home, the representativeness of the sample is not strong. Existing surveys and researches are often only conducted in a single city, basically in Beijing, Shanghai, Nanjing and other cities; there are few studies on consumers' awareness of and attitude towards genetically modified food in small and medium-sized cities.

Therefore, in order to regulate the development of genetically modified food market, provide a reference for the relevant departments to formulate regulatory policy of genetically modified food, make the consumers have a clear concept of genetically modified food and then safely and rationally consume genetically modified food, we take the case of transgenic edible oil, to conduct questionnaire survey of the consumers in the markets of five major cities in Yanbian Korean Autonomous Prefecture (hereinafter referred to as the " Yanbian Autonomous Prefecture "); conduct in-depth analysis of consumers' awareness of and willingness to buy genetically modified food and the influencing factors. Based on these, finally we put forth the relevant policy recommendations on how to strengthen the publicity and management of genetically modified food in the future.

1 Survey object and survey methods

In the period July – August 2010, our research group selected five major cities (all county-level cities), Yanji City, Longjing City, Dunhua City, Tumen City and Hunchun City in Yanbian Prefecture as the research cities. In each city, we selected department stores, international trade supermarkets and other large supermarkets as specific survey location; transgenic edible oil as the main observation object; the ordinary purchase public as the survey object.

As for the survey method, we visited several large supermarkets in the aforesaid five cities, mainly using the method of field surveys and questionnaire surveys, to randomly understand the consumers' awareness of and willingness to buy the genetically modified food and the influencing factors. In the survey, 300 questionnaires were distributed, and 292 valid questionnaires were called back.

To ensure the quality of survey data, we attach great importance to the questionnaire design and survey staff training. In order to better reflect the attitude of consumers towards genetically modified food, we carefully designed the questionnaire; prior to the survey, we gave the survey staff careful training (the training content includes the purpose of this study, survey method, questionnaire, *etc.*), and put special emphasis on how to maintain strict neutrality in the survey.

2 Analysis of consumers' awareness of genetically modified food in Yanbian Prefecture

In order to study the consumers' awareness of the genetically modified food, we raised four questions related to GM

foods to the respondents. The survey results show that 91.2% of consumers have heard of genetically modified edible oil, of which 37.2% of consumers have often heard about the information on genetically modified food (Table 1), indicating that consumers have been familiar with the term " GM " ; the current transgenic technology is no longer just the study object of laboratory experts, having gone deep into the society as a whole.

From the degree of consumers' understanding of genetically modified food, among the respondents who have heard of the genetically modified food, only 14.1% of them learn about some aspects on genetically modified food, and 85.9% of them do not know about genetically modified food (Table 1), indicating that although the consumers in small and medium-sized cities are familiar with genetically modified food and the related terms, few of them truly understand.

The safety of genetically modified food is the focus of genetically modified food debate. The supporters and opponents stick to their own views. At present, the scientific community is inconclusive about this, and the consumers are more likely to form different views due to difference in the information they master.

In this survey, 92.6% of the respondents choose " Having never heard of the international discussion on safety of genetically modified food " (Table 1). After the consumers obtain the relevant definition information on the GM technology, 34.5% of them think that the genetically modified food is safe; 21.2% of them think that the genetically modified food is not safe; 44.3% of them are unable to judge. It can be seen that the number of consumers who tend to believe that genetically modified food is safe is greater than the number of consumers who believe that genetically modified food is not safe, but more consumers can not express their opinions on the safety of genetically modified food.

Whether having heard of genetically modified edible oil	Percentage // %
Having heard of	91.2
Never	8.8
Whether often learning about or see information on genetically modified food	
Often learning about or see	37.2
Occasionally learning about or see	54.0
Learning about some aspects on genetically modified food	
Types	7.6
Characteristics	1.0
Food labeling policies	5.5
Only having heard of, but not know well	85.9
Whether having heard of the international discussion on safety of genetically modified food	
Having heard of	7.4
Never	92.6

Note: Data are from sorting of the survey data

3 Analysis of consumers' willingness to buy genetically modified food in Yanbian Prefecture and the influencing factors

The survey results show that 34.5% of consumers are will-

ing to buy the genetically modified food whose safety is inconclusive, while 65.5% of consumers say they will not buy the genetically modified food, indicating that consumers' willingness to buy genetically modified food is not high. Then what factors affect consumers' willingness to buy genetically modified food? As a matter of fact, there are many factors influencing

consumers' purchase of genetically modified food, and we conduct in-depth survey and analysis of this question. From the survey results of Table 2, we see that the prices of genetically modified food, consumers' educational level and income have great impact on consumers' willingness to buy genetically modified food, while the impact of age and gender is small.

Table 2 Factors influencing consumers' willingness to buy genetically modified food in Yanbian Prefecture

Influencing factors	Factor classification	Willing to buy genetically modified food	Willing to buy non-genetically modified food	Indifferent
Price	$P_a > P_b$	4.4	63.9	21.7
	$P_a = P_b$	27.4	54.5	18.1
	$P_a < P_b$	38	40.1	21.9
Gender	Male	26.8	56.3	16.9
	Female	27.9	53.3	9.2
Age	25 and below	26	54.6	19.4
	26 – 60	24.6	57.2	18.2
	61 and above	31.2	53.7	15.1
Educational level	Primary school and below	75	12.5	12.5
	Junior high school, senior high school and technical secondary school	33.2	47.5	19.3
	College and above	25.2	56.5	18.3
Annual income	Below 10 000 yuan	36.8	31.6	31.6
	10 000 – 30 000 yuan	29.6	52.3	18.1
	30 000 – 50 000 yuan	28.1	54.1	17.8
	Above 50 000 yuan	22.6	60.7	16.7

Note: Data are from sorting of the survey data; P_a is the price of genetically modified food; P_b is the price of non-genetically modified food.

3.1 The impact of prices of genetically modified food on consumers' willingness to buy When the price of genetically modified food is the same as that of non-genetically modified food, 27.4% of consumers say they are willing to buy genetically modified food; 54.5% of consumers are willing to buy non-genetically modified food; 18.1% of consumers do not care. It indicates that consumers' willingness to buy genetically modified food is not high.

When the price of genetically modified food is lower than that of non-genetically modified food, the proportion of consumers willing to buy genetically modified food rises to 38.0%; when the price of genetically modified food is higher than that of non-genetically modified food, only 4.4% of consumers are willing to buy genetically modified food. It indicates that price is one of main factors influencing consumers' willingness to buy genetically modified food.

3.2 The impact of educational level on consumers' willingness to buy It can be seen from Table 2 that in the group of consumers with educational level of the primary school and below, 75% of consumers are willing to buy genetically modified food; in the group of consumers with educational level of senior high school and technical secondary school, 33.2% of consumers say they will choose genetically modified food; in the group of consumers with educational level of college and above, only 25.2% of consumers are willing to buy genetically modified food.

We can see a very clear trend, that is, with improvement in the educational level, the proportion of consumers willing to buy genetically modified food is declining gradually, and the highly educated consumers are not inclined to buy genetically modified food.

The above results show that the educational level has significant impact on consumers' willingness to buy, and with improvement in the consumers' educational level, the proportion of consumers willing to choose genetically modified food is getting smaller and smaller.

3.3 The impact of income on consumers' willingness to buy By comparing the consumers with various income levels, we see that in the group of consumers with annual income level of 10 000 yuan and below, the proportion of consumers willing to buy genetically modified food is 36.8%; in the group of consumers with annual income between 10 000 and 30 000 yuan, the proportion of consumers willing to buy genetically modified food is 29.6%, but in the group of consumers with annual income of 50 000 yuan and above, only 22.6% of consumers say they will choose genetically modified food.

In other words, with improvement in the income level, people's willingness to purchase genetically modified food is declining, but willingness to purchase non-genetically modified food is on the rise.

3.4 The impact of age and gender on consumers' willingness to buy In this survey, we find no the impact of age on consumers willingness to buy. In the group of consumers aged 25 and below, 26% of them are willing to buy genetically modified food; in the group of consumers aged 26 – 60, 24% of them are willing to buy genetically modified food; in the group of consumers aged 61 and above, 31.2% of them are willing to buy genetically modified food (Table 2).

This also indicates that due to the problem of awareness, even the elderly have no doubts about the safety of genetically modified product. In addition, from the table, we see that gender has certain influence on the consumers' willingness to buy

genetically modified food. The female consumers' willingness to buy genetically modified food is slightly higher than that of male consumers (27.9% > 26.8%), but this effect is relatively small, and there is no significant difference between the two.

4 Conclusions and recommendations

4.1 Conclusions Through the questionnaire survey, this article researches the consumers' awareness of the genetically modified food, willingness to buy the genetically modified food, and the influencing factors in Yanbian Prefecture. The research conclusions are as follows.

4.1.1 Consumers' awareness of genetically modified food is not high in Yanbian Prefecture and their willingness to buy is also low. The survey results show that 91.2% of consumers in Yanbian Prefecture have heard of genetically modified edible oil, but only 14.1% of people say that they know about the genetically modified food, indicating that the majority of consumers' awareness of genetically modified food in Yanbian Prefecture is still relatively low, which may be related to low income level in small and medium-sized cities, little information on genetically modified food, and other factors.

In comparison with the conclusions on the consumers in big cities as the study object, the consumers' awareness of the genetically modified food in the Yanbian area is slightly lower, but there is no significant difference. The survey results also show that only 34.5% of consumers are willing to buy the genetically modified food whose safety is inconclusive, indicating that the consumers' willingness to buy genetically modified food is also not high.

4.1.2 Educational level, prices and income level have great impact on consumers' willingness to buy genetically modified food. Among various factors influencing consumers' attitudes toward genetically modified food, educational level, prices, and income, have great impact on consumers' willingness to buy genetically modified food.

The survey results show that with the improvement in educational level, the proportion of consumers who are willing to buy non-genetically modified food is gradually increasing; the highly educated consumers are inclined not to buy genetically modified food; under the condition that the price of genetically modified edible oil is the same as that of non-genetically modified edible oil, consumers are more inclined to buy non-genetically modified edible oil; with improvement in the income level, people's willingness to buy genetically modified food is declining, but their willingness to buy non-genetically modified food is on the rise. The survey results show that age and gender have small impact on consumers' willingness to buy genetically modified food.

4.2 Recommendations

4.2.1 Increasing publicity efforts to safeguard consumers' right to know and choose. Now that the current safety of some genetically modified foods in the world is not determined, then the consumers have the right to know whether the food they buy is genetically modified food or not and decide whether to buy or not. In order to popularize the basic knowledge of genetically modified food and make the common consumers have a basic understanding of genetically modified food, so that the

consumers are rational when making buying decisions, it is necessary to carry out different forms and different levels of science popularization activities on genetically modified food for different people, promoting the transparency of the relevant information on genetically modified food and the public participation in the safety management.

At present, China has set up "mandatory labeling system" of genetically modified food, but it still does not fully live up to expectations. We should learn from experience from the European Union, Japan and other countries, to improve China's "mandatory labeling system" of genetically modified food. The relevant food management departments in Yanbian Prefecture should take the initiative to use the media of television, newspapers and magazines and Internet, to publicize more information about genetically modified food to consumers. In particular, there is a need to make a thematic introduction to help the majority of consumers to have a correct understanding of genetically modified food and better safeguard consumers' right to know.

4.2.2 Increasing supervision efforts to improve the existing regulatory system of genetically modified food. In order to better regulate genetically modified food market, the static system is not enough, and the late dynamic execution and supervision are also crucial. From the advanced supervisory experience abroad, the food safety regulatory agencies beyond the various departments have been established, such as the European Food Safety Authority, the American Food Safety Commission, the Japanese Food Safety Commission, which are responsible for risk assessment and comprehensive coordination.

China has also set up Food Safety Commission, but its duties are not yet clear. Consequently, in the implementation rules of the *Food Security Act*, it is necessary to make the authority of Food Safety Commission clear, and invest the National Food Safety Commission with the function of the risk assessment and comprehensive coordination; in particular, to make Food Safety Commission as the highest-level coordination body, conduct full supervision on the national food safety work on the whole. We should strengthen the authority of the Food Safety Commission, establish centralized and unified regulatory system, and strengthen the coordination and cooperation between safety management departments of genetically modified food, in order to improve the effectiveness of supervision. The related bodies in Yanbian Prefecture should establish and perfect the relevant systems on regulation, commercialization and other issues concerning genetically modified food, to promote the harmonious and orderly development of the related work, and reduce consumers' qualms about the safety issues on genetically modified food.

4.2.3 Actively organizing forces to carry out the study on safety of genetically modified food. In the case of having no definite conclusions, we should disclose more positive and negative findings. The national authoritative departments should actively organize forces to conduct basic research on the safety of genetically modified food. At the same time, the risk assessment, rapid research and development of security detection technology on genetically modified food, are also required by circumstances,

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so as to provide the correct direction of public opinion for consumers' purchase of genetically modified food as soon as possible. Yanbian Prefecture can conduct research on the safety of genetically modified food, by giving play to the intellectual superiority of experts and scholars in the Agricultural College of Yanbian University, Yanbian Academy of Agricultural Sciences and other institutions.

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