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## IMPLICATIONS OF THE CONSUMER RESPONSE TO EMERGING TECHNOLOGIES AND DISEASES FOR INTERNATIONAL TRADE: THE CASE OF JAPAN

By

Hiromi Ouchi, Jill J. McCluskey, And Thomas I. Wahl<sup>1</sup>

### Introduction

There has been a recent transformation of the way consumers think about food. Food is now viewed as something one must be vigilant about and protect children from. Several visible issues illustrate this consumer-based trend. Genetically modified (GM) food has become controversial, and many consumers perceive GM food products as a health threat. Bovine Spongiform Encephalopathy (BSE), commonly known as “Mad Cow Disease,” was discovered in Europe, Japan, Canada, and now recently, the United States. As a result, beef throughout the world is considered suspect. Although hoof and mouth disease does not affect humans, the recent outbreak, which caused herds of animals to be destroyed in Europe, cannot be viewed as a positive force on consumer perceptions of the food system.

The public’s beliefs about health risks are often very different from those of the experts. Many European and Japanese consumers believe that genetically modified organisms (GMOs) pose a threat to human health. Even so, scientists at the U.S. Food and Drug Administration (FDA) argue that there is no health-related or scientific reason to reject genetically modified (GM) commodities and food products. Regardless of the regulations, the public’s *perception* of risks, rather than scientifically proven risks, that directly affects markets. As the saying goes, “The customer is always right,” even when he or she disagrees with the leading scientists.

Similarly, even though there were no confirmed cases of Mad Cow Disease in the United States at the time of the Japanese discovery, the Mad Cow Disease scare in Japan resulted in U.S. beef producers losing hundreds of millions of dollars in sales. U.S. beef shipments to Japan dropped by as much as 50% a month in volume since the first case of Mad Cow Disease was found in Japan in September 2001 (Ono, 2002). The important question for the beef industry was how to win back this previously growing market.

In order to satisfy consumers, many countries require mandatory labeling of GM food products. GM labeling policy is controversial, and specific policies have been challenged as non-tariff barriers to trade. For example, the United States challenged the European Union’s mandatory labeling requirement for certain food products produced from GMOs under the Agreement on Technical Barriers to Trade (GATT, 1994). A consideration in this debate should be scientific versus consumer sovereignty (Roberts, 1999). Although the scientific consensus may be that GMOs are completely safe for consumption aside from potential allergens, it may be the case that a majority of the population in a given country prefers to avoid GMOs. Should it be considered a barrier to trade if that country’s government imposes mandatory labeling requirements on all imports? Although domestic firms may face the same requirement, it may not be a binding constraint for them if they are not leaders in biotechnology research. In many countries, such as Japan, consumers are truly concerned about GMOs.

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<sup>1</sup> former graduate student, Dept. of Ag & Resource Economics, Washington State University; Assistant Professor, Dept. of Ag & Resource Economics, Washington State University, Pullman, WA 99164-6210, email: [mcccluskey@wsu.edu](mailto:mcccluskey@wsu.edu); and Director, International Marketing Program for Agricultural Commodities and Trade (IMPACT) Center and Professor, Dept of Ag & Resource Economics, Washington State University.

## Findings

This paper discusses the findings of three related, but unique, consumer studies: (1) an empirical study of Japanese consumer preferences and willingness to accept genetically modified food products; (2) an empirical study of consumer response to the discovery of BSE in Japan and willingness to pay for BSE-tested beef; and (3) an analysis of GM labeling policy and the implications for U.S.-Japanese trade.<sup>2</sup>

### *The Consumer Response to GM Food in Japan*

In Japan, a large U.S. export market, there has been growing public opposition to GM foods. This study utilizes survey data which was collected for the purpose of this study with in-person interviews conducted in Japanese at a Seikyuu, in Matsumoto City, Japan, during June 2001. In total, 400 consumers were surveyed. The survey solicited data on respondents' demographic characteristics, their attitudes about the environment and food safety, and their self-reported knowledge and perceptions about biotechnology. Information about environmental and food safety attitudes was obtained by presenting trade-off situations between environmental quality and economic growth, and between food safety and low prices, respectively. Eliciting these attitudes from trade-off scenarios is an effective way of ensuring that the survey information is informative as well as useful in an empirical modeling context. Summary statistics for the variables used in this analysis are presented in Table 1.

**Table 1. Summary statistics: GM study in Japan**

<b>Variable</b>	<b>Description</b>	<b>Distribution</b>
<i>Female</i>	1 if female 0 if male	78% 22%
<i>Education</i>	1 if compulsory school 2 if HS diploma 3 if 2-3 year college 4 if 4-5 year degree 6 if Adv./Prof. degree 7 if refuse	3.75% 42.5% 19.5% 17.25% 13.5% 3.5%
<i>Income</i>	Income in 1000 yen	Mean = 6,350 Std. dev. = 2,500
<i>Environment</i>	Scaled from 1 to 10; where 1 if economic growth is all-important and 10 if environment is all-important	Mean = 6.5 Std. dev. = 1.91
<i>Food Safety</i>	Scaled from 1 to 10. where 1 food prices are all-important and 10 food safety is all important	Mean = 7.9 Std. dev. = 1.94
<i>Risk</i>	1 if high or low GM risk 0 if no GM risk	74% 26%
<i>Opinion</i>	1 if favorable or neutral opinion about biotech, 0 if negative opinion	12% 88%
<i>Knowledge</i>	1 if high or little knowledge about biotechnology 0 if no knowledge	82% 18%

<sup>2</sup> This research is largely drawn from Hiromi Ouchi's masters thesis at Washington State University, which was awarded the 2003 Western Agricultural Economics Association's Award for Best Thesis.

The survey included contingent valuation (CV) questions regarding willingness to accept (WTA) discounts to purchase noodles made from genetically modified wheat. Consumers were first asked if they were willing to pay the same price for noodles made with GM wheat as noodles made with the corresponding conventional wheat. If the respondent's answer to this question was "no," a follow-up question was asked in which the respondent was offered a random discount on the GM noodles relative to the non-GM noodles.

The model used to examine the outcomes of our survey can be considered a special case of the double-bounded logit model (Hanemann et al. 1991). In this model, the initial bid was set at zero and implied no price difference between GM noodles and non-GM noodles. The second bid was the discount for the GM noodles relative to the non-GM noodles. This bid was only given to individuals who answered that they would not buy GM noodles at the same price as non-GM noodles. The WTA function for GM noodles was estimated as a function of the discount bid and a column vector of characteristics (food safety and environmental attitudes, self-reported knowledge and risk perceptions about biotechnology, gender, income, and education) and a random variable accounting for random noise and possibly unobservable characteristics. (See McCluskey et al, 2003, for a detailed presentation of the model).

The estimation results are presented in Table 2. The estimation results indicate that Japanese Seikyou respondents, on average, wanted a 60% discount to choose GM noodles over non-GM noodles. A greater discount was required to choose GM noodles for consumers who self-reported a high level of knowledge about biotechnology and high levels of risk perceptions toward GM-food. Also, respondents who had a high level of concern about food safety required a greater discount to choose GM food. Interestingly, gender and income did not significantly affect the required discount for GM-food. These results support Baker and Burnham's (2001) findings that cognitive variables (opinions, beliefs, knowledge), moreso than demographics, are very important in consumer preferences for GM foods. For a more comprehensive analysis and discussion of this data, see McCluskey et al (2003).

**Table 2. Parameter Estimates for WTA model:  
GM Study in Japan**

<b>Variable</b>	<b>Estimate</b>	<b>p-value</b>
<i>Intercept</i>	-1.3214	0.0000
<i>Bid</i>	5.3704	0.0000
<i>Food</i>	-0.0846	0.0058
<i>Safety*Environment</i>		
<i>Knowledge</i>	-0.6543	0.0152
<i>Risk</i>	-1.7128	0.0000
<i>Female</i>	-0.0368	0.4528
<i>Income</i>	-0.4604	0.0776
<i>Education</i>	-0.4965	0.0406

*Bse In Japan: Consumers' Perceptions And Willingness To Pay For Tested Beef*

Food safety issues are receiving greater attention than ever in Japan. The discovery of Bovine Spongiform Encephalopathy (BSE), commonly known as "mad-cow disease," in Japan caused anxiety about consuming beef and beef products. Until the BSE outbreak, the prospects for the Japanese beef market had been promising. Annual Japanese beef consumption had tripled over recent decades to about 21 pounds per person (Brooke 2001), and the Japanese beef market had been liberalized, allowing for the importation of fresh/chilled and frozen beef. The BSE-scare caused a sudden, extreme disruption in consumer demand for beef. As a result, there was a sudden fall in sales of beef, which

hurt the Japanese beef industry as well as major beef exporters to Japan. A motivation for this research was to answer the question of how to restore the public confidence in safety of beef.

A consumer survey was conducted for the purpose of this study at a Seikyou, in Nagano, Japan during December 2001. This survey solicited data on respondents' demographic characteristics, their attitudes about the environment and food safety, their self-reported knowledge about BSE, their risk attitudes about beef from different origins, and their beef consumption habits. Concerning changes in consumption habits after the BSE-outbreak, 11% of respondents indicated that after the BSE discovery they started avoiding beef. Of those who still included beef in their diets, 23% ate beef daily or at least once a week, and 66% ate beef at least once a month. Eighty-six percent of respondents answered that they consumed less domestic beef since the BSE-outbreak. The fact that such a high percentage of respondents reduced their consumption of beef highlighted the impact of BSE, especially since habit was identified as important in Japanese beef demand (Price and Gislason, 2001). Summary statistics for the variables used in this analysis of Japanese consumer response to BSE are presented in Table 3.

**Table 3. Summary Statistics for BSE Japan Study**

<b>Variable</b>	<b>Description</b>	<b>Mean</b>
<i>Female</i>	1 if female/0 if male	0.82
<i>Environment</i>	Scaled from 1 to 10; where 1 if economic growth is all-important and 10 if environment is all-important	7.10
<i>Food Safety</i>	Scaled from 1 to 10. where 1 food prices are all-important and 10 food safety is all important	7.96
<i>Knowledge</i>	1 if high self-reported knowledge about BSE 0 if little or no self-reported knowledge about BSE	0.90
<i>Lessbeef</i>	1 if consume less domestic beef 0 if no change	0.86

Survey respondents were asked if they were willing to pay a random premium for beef tested for BSE compared to the corresponding, non-tested product. Of the 381 respondents, 65.9% responded that they were willing to pay a premium for BSE-tested beef. This analysis utilized contingent valuation dichotomous choice methodology. A single-bounded logit model was used to analyze factors affecting willingness to pay (WTP) a premium for BSE-tested beef.

The premium (bid) information and other demographic, knowledge, and attitudinal information were used to estimate the magnitude of factors that affect Japanese consumers' WTP for BSE-tested beef and how much of a relative premium Japanese consumers were willing to pay for this product. Overall, results indicated that Japanese Seikyou respondents, on average, were willing to pay a 56 percent premium for BSE-tested beef (Table 4). The estimation results also showed that food safety and environmental attitudes, reduction in beef consumption following the BSE outbreak, and being female all have a statistically significant positive effect on the WTP for BSE-tested beef. For a more comprehensive analysis of this data, see Ouchi et al (2004).

#### *GM Food Policy and U.S.-Japanese Trade*

Finally, the effect of GM food policy and food safety, especially in terms of food labeling, has important implications for U.S.-Japanese trade. The Codex committees of the World Trade Organization (WTO) are working to harmonize international standards and resolve trade disputes associated with food labeling in order to promote fair trade of foods and protect consumer health. Since different countries have different attitudes toward GM food products, the Codex frameworks allow each country to develop their own standards. There has been a worldwide trend to implement food labeling for food products

that contain GMOs. The problem of asymmetric information may increase consumer anxiety about GM food products, which results in a greater need for GM foods to be accurately labeled. Governments have two policy options for GM food products: mandatory and voluntary labeling. Both mandatory and voluntary labeling give consumers choices based on their perceptions about GM foods and give producers an opportunity to differentiate their products. However, mandatory labeling is a hotly debated issue and is sometimes perceived as non-tariff trade barriers for major GM exporting countries.

Table 4. Parameter Estimates for WTA Model:  
BSE Study in Japan

Variable	Estimate	p-value
<i>Intercept</i>	-0.3933	0.369
<i>Bid (Premium)</i>	-2.3874	0.000
<i>FoodSafety*Enviro</i>	0.1004	0.020
<i>Lessbeef</i>	0.7709	0.015
<i>Female</i>	0.5498	0.053

## Conclusions

The United States and Japan have been important partners in the international trade of agri-food products for many years. Consequently, it is important for both U.S. policy makers and food exporters to understand Japanese consumers' preferences and attitudes toward biotechnology and food safety. A policy concern is that food labeling will be used strategically to create non-tariff barriers to trade. The cost of meeting the standards associated with each labeling policy will differ depending on a country's comparative advantage. Consequently, one country may push for specific GM labeling requirements because of the effects on their rivals. Even if GM labeling policy is not made strategically, it may not have a detrimental effect on the ability to trade for countries in other regions of the world. Most importantly, consumer preferences should be included in the policy equation. Clearly, in practice, any trade policy solution will be complicated, including the fact that there is often no consensus across regions on risk assessment for GM food products.

Based on the empirical findings of this line of research, there is an opportunity to market food segregated from GM products and BSE-tested beef in Japan. For those firms who want to market either GM foods or beef in Japan, they need to convince Japanese consumers of the safety of their products with consumer education campaigns and credible risk communication. It suggests that there is at least a niche market for BSE-risk-free beef. However, in order to command a price premium, consumers must be convinced of the safety of labeled beef products through documentation of standards and inspections.

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