

Attitudes toward Food and Biotechnology in the U.S., Japan, and Italy

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1. Introduction

Research conducted by Wolf, Bertolini, and Parker-Garcia [1] indicates that the Italian food purchaser is less likely to purchase genetically modified food products than the consumer in the United States. To date, the United States has managed to avoid food scares such as the mad cow disease and the other food safety scares that have plagued Europe. Americans are much more confident about the safety of their food supply and trust government regulation more. This confidence has led American consumers to be more accepting of genetically modified foods. A recent study by *Fresh Trends 2001*, found that American consumers felt it was appropriate to modify food items genetically to: be more resistant to plant disease and less reliant on pesticides, 70%; help prevent disease, 64%; improve nutritional value, 58%; improve flavor, 49%; and extend shelf life, 48% [2].

By contrast, in the European Union (EU) the consumer generally views that genetically modified foods as unhealthy. The politically active “Green Movement” has done much to publicize and put the issue of genetically altered food on the European continent in a negative light. For example, it has derisively nicknamed genetically altered food “Frankenfoods.” A survey cited by the EU found that most Europeans see genetically modified food as health hazards, despite assurances from producers [3]. In November 1999, the European Commission passed a law requiring all European retailers to label food containing more than 1% genetically modified ingredients. The Commission also required restaurants to inform consumers if meals contained genetically modified ingredients.

Similar to the EU, Japan requires the labeling of foods produced with genetically modified ingredients. According to the Ministry of Health, Labor and Welfare, the labeling of GM foods has been required in Japan since 2001 [4]. Further, in order for a product to be labeled “not genetically modified,” record keeping must begin with the farmer while

certification should begin at the first collection elevator. Documents and official third party certificates will include information such as the seed name and number, quantity purchased and date of purchase. At each stage (farmer, collection elevators, transportation means and end user) certification by a supervisory authority confirms that the proper handling methods for non-genetically modified crops were observed. Certificates, records and other documents for each stage must be kept for a minimum of two years [5].

Although labeling is required in Japan, the Japanese government also supports the development of genetically modified seeds to grow food on Japanese land that is limited in availability for farming. The Japanese government supports GMO crops because such crops are resistant to climate problems, diseases, and lessens the amount of pesticides. The Japanese government established “Bio Policy” in year 2000 to support the development of genetically modified plants and organisms, in order to use them for medical uses and rice production.

The Japanese government is working on creating the legislation to prevent the possibility of violation of the ecosystem by crossing GM plants or organisms and wild plants or organisms [6]. The Japanese government is going to regulate imports, cultivation, distribution, safety evaluation, and development and experiment of GM plants and organisms. The cultivation of non-permitted plants will be penalized [7].

While the government is supporting the development of GMO crops, the Japanese consumers are concerned about GMO foods. There were two surveys done by the government which show the public attitudes toward GMO food. One was a case study done in 2002. The government collected 1661 responses from all over Japan. The target was female grocery shoppers, age range from 20 to 50. Those respondents’ main interests concerning food were expiration date, followed by price, place produced, pesticide, and finally GMO. GMO fell to fifth as a concern from its fourth ranking in the previous year. Incidents happened in Japan that have affected polls among consumers. In one incident during 2002 Snow Brand used expired butter as an ingredient for a product by changing the expiration. In another incident 13,000 people were made ill from food poisoning from drinking Snow Brand’s low-fat milk in the year 2001. In addition, Nippon Hum sold products made from imported beef as products made from domestic beef in 2002. These incidents increased the importance of other issues and decreased the importance of GMO. In the consumer survey, 97.2% of respondents have heard of GMO; 62.9% have heard of the name “GMO” but did not know what it is; the remaining 34.3% of respondents answered that they know what GMO is. The respondents are receiving information about GMO primarily by TV, 74.9%; articles in newspapers, 49%; and the point of purchase advertisements at the stores,

45.3%. Researchers found that the point of purchase advertisement at the stores is becoming more influential to the respondents' awareness of GMO.

Respondents' recognition of products that actually are genetically modified are very accurate. Respondents think that potato, corn, soybeans, most of soybeans products, such as tofu, natto, and soybean paste, are genetically modified foods. The image and interest toward GMO is very low among Japanese respondents. Most respondents, 80%, answered that they have a negative image of GMO foods. The reason why people have a negative image is because some food labels say "GMO free". Since respondents prefer to eat natural foods instead of artificial foods, the "GMO free" on the labels generates a negative image for GMOs. Further, since the effect of eating genetically modified food on health and safety has not been proven yet to the Japanese consumer, it reduces the likelihood of buying GMO foods. Three-fourths of respondents to the government survey answered they are not willing to eat GMO foods while most consumers, 87%, indicate that they need information about GMO [8].

The second survey was taken to determine consumers' opinions about the reliability of food labeling and how the labeling should be in the future. It was found that more than 90% of respondents check the labels then they purchase food. Older respondents check the food labels more often. More than half, 60% of respondents, indicated that they wanted to complain about food labeling. To improve the labeling, respondents think that the government should increase inspections and penalties to reduce the violations of label regulations. Respondents also want a nonprofit organization to watch food makers for violations. The respondents indicate that they want conformity of wording on labels: 82% want the label to use regulated wording to make it easy to understand. Further, 62% of respondents want the prohibition of exaggerated phrases. In addition to the label, 80% of respondents think information about food at the stores would be the most helpful resource to understand more about food. The survey also included a question asking what respondents can not trust on the package. For raw food products, respondents named location of its production as the least trustworthy item followed by organic/ less pesticide, expiration, freshness and GMO. For processed foods, consumers named the location of its production, as well, followed by expiration, additives, ingredients and GMO [9].

The purpose of this research is to compare the attitudes of three subsets of consumers in the United States, Italy and Japan toward genetically modified food. In addition, the objective of this research is to determine if there are also differences in general attitudes toward food, cooking and mealtime between the U.S., Japan, and Italy. Differences in

attitudes between the U.S., Italian, and Japanese respondents concerning the following are examined in this research: organic food, genetically modified food, the use of food labeling, locally grown food, food grown in own country, food traceability, use of irradiation, price, meals eaten away from home, importance of main meal to household, concern about food safety, enjoyment of cooking, and lack of time for cooking.

2. Methodology

The research uses a survey instrument that was administered through the use of a personal interview during the fall of 2002 and winter of 2003 in the United States, during the winter of 2003 in Italy, and during the spring of 2003 in Japan. The random sample of 550 food shoppers for the United States was collected in San Luis Obispo County, California. San Luis Obispo County was designated the best test market in the United States by *Demographics Daily* [10]. San Luis Obispo was found to be the best of 3,141 counties to represent a microcosm of the United States based on 33 statistical indicators. The random sample of 200 food shoppers for Italy was collected in Modena, Italy during the winter of 2003. Modena, in Emilia Romagna, is a rich industrial area that represents one of the most important areas of food production in Italy for both industrial food and for typical traditional quality food such as parmesan cheese, Modena ham, Parma ham, and Modena vinegar. In addition, Modena is important to the food distribution system of Italy since the largest distribution group, Coop, resides in Modena. These characteristics make Modena an important area to represent consumers' attitudes toward food in Italy, especially in Northern Italy. Household income in this region is higher compared to the average household income level in Italy [11]. The random sample of 128 food shoppers for Japan was collected in Tokyo and Chiba, Japan during the spring of 2003. Tokyo is the capital of Japan and the largest city in the world with a population of 12 million and a daytime population of more than 14 million. Tokyo's industrial structure is characterized by a large proportion of financial/insurance/real estate firms, service firms catering to enterprises, and wholesale/retail firms [12]. Since new products from other parts of Japan and other countries come into Tokyo continuously, people are very familiar with a variety of food from all over the world.

3. Attitudes toward Genetically Modified Foods

Tables 1 and 2 show that the U.S. consumer is more familiar with genetically modified food than the Italian and Japanese consumers. Further, the Japanese consumer is

more familiar with genetically modified food than the Italian consumer. This research has observed a similar level of familiarity among Japanese respondents, 33.3%, as that reported by the Council for Biotechnology Information in Japan, 34.3%. The levels of familiarity observed in the industrialized countries, U.S., Japan, and Italy, are significantly higher than those observed by Pachico and Wolf in Colombia, in 2001. [13]. There is a very low level of familiarity with genetically modified food in Colombia. The vast majority of the Colombian sample, 77.6%, reports that they are not at all familiar with genetically modified food. Only 5.4 % indicate they are very familiar with transgenic food and 7.5% say they are somewhat familiar.

Table 1 Familiarity with Genetically Modified Food

| Familiarity with Genetically Modified Food | COUNTRY | | | Total | Chi Square |
|---|-------------------------|--------------|--------------|--------------|-------------------|
| | with Modified US | Italy | Japan | | |
| Not at all familiar | 21.40% | 16.50% | 4.00% | 17.70% | 50.465** |
| Not very familiar | 37.80% | 55.50% | 62.70% | 45.40% | |
| Somewhat familiar | 32.70% | 24.00% | 31.70% | 30.50% | |
| Very familiar | 8.20% | 4.00% | 1.60% | 6.30% | |

** Significant at the .05 level

* Significant at the .10 level

Table 2 Familiarity with GMO foods

| | U.S. | Japan | Chi Square |
|--------------------------|-------------|--------------|-------------------|
| Not at all | 21.4% | 4% | 38.572 ** |
| Not very familiar | 37.8% | 62.7% | |
| Somewhat familiar | 32.7% | 31.7% % | |
| Very familiar | 8.2% | 1.6% | |

** Significant at the .05 level

In order to examine general attitudes concerning the purchasing of genetically modified food, consumers were asked: “How likely are you to purchase a food product that

has been genetically modified where definitely = 5, probably = 4, maybe = 3, probably not = 2, and definitely not = 1. It is important to note that this question is a general attitudinal question and is not used for forecasting the purchase probability of a specific product at a specific price. Tables 3 and 4 show that consumers in the U.S. and Japan indicated a higher purchase probability than those in Italy. The Italian consumer indicated, probably not, while the U.S. and Japanese consumers indicated probably not to maybe. These results indicate that differences in attitudes concerning genetically modified foods exist between different industrialized countries. As a comparison, the research generated by Pachico and Wolf in 2001 indicates that Colombian consumers and U.S. consumers have a similar purchase interest in genetically modified food products. Two-thirds of Colombian consumers indicated a positive purchase interest, while slightly less than two-thirds of U.S. consumers indicated a positive purchase interest. It must be noted that a majority of Colombian consumers indicated that price is the most important factor when purchasing food and only a small proportion of Colombian consumers are familiar with genetically modified food. Attitudes may change as more Colombians become familiar with genetically modified food and price becomes less important.

Table 3 Mean likelihood to purchase genetically modified food

| | US N=550 | Italy N=200 | Japan N=128 | F |
|--|---------------------|--------------------|---------------------|----------|
| Likelihood to purchase genetically modified food | 2.8336 ¹ | 2.095 ² | 2.6797 ¹ | 41.048** |

Table 4 Tukey Post Hoc Likelihood of purchasing genetically modified food

| | | Mean Difference | Sig. |
|-------|-------|--------------------|-------|
| US | Italy | 0.7386 | **0 |
| | Japan | 0.154 | 0.252 |
| Italy | US | -0.7386 | **0 |
| | Japan | -0.5847 | **0 |

Tables 5 and 6 show that consumers in Italy, where there is mandatory labeling of genetically modified foods, indicate that labeling is more important to them than to consumers in the United States and Japan. Although Japan requires labeling, it is less important to Japanese consumers than to the Italian consumer and the U.S. consumer. The survey by the Japanese government indicates that other labeling issues are more important to the Japanese consumer. This may be a result of the labeling fraud that occurred in Japan recently.

Table 5 Importance of imposing mandatory labeling by government

| Mandatory Labeling of Genetically Modified Food | COUNTRY | | | Total | Chi Square |
|---|---------|--------|--------|--------|------------|
| | US | Italy | Japan | | |
| Not at all important | 4.20% | 0.50% | 15.00% | 4.90% | 77.601** |
| Not very important | 14.90% | 6.00% | 15.00% | 12.90% | |
| Somewhat important | 36.40% | 23.00% | 20.50% | 31.10% | |
| Very important | 44.40% | 70.50% | 49.60% | 51.10% | |

** Significant at the .05 level

* Significant at the .10 level

Table 6 Importance of imposing mandatory labeling by government

| | US | Japan | Chi Square |
|-----------------------------|-------|-------|------------|
| Not at all important | 4.2 % | 15% | 24.706** |
| Not very important | 14.9% | 15% | |
| Somewhat important | 36.4% | 20.5% | |
| Very important | 44.4% | 49.6% | |

** Significant at the .05 level

4. Desirability Ratings of Food Characteristics

A successful product positioning is based on the factors that motivate consumers to purchase one product versus other products. In order to develop a successful positioning for a food product, the characteristics that are desirable to consumers when they shop for food must be identified. The characteristics that consumers want when they purchase foods are examined by desirability ratings [14]. The most desirable characteristics should be used in the development of a product positioning since those are the most important to consumers when they purchase a new product. The product positioning should also stress the characteristics that the consumers perceive the product to have relative to the competition. Further, in new product development, producers should develop products with the highly desirable attributes.

Consumers were asked to rate the desirability of nineteen characteristics of food to them when they make a decision to purchase food. They were asked the following question: “The following list shows features people may look for when they purchase food. Please indicate the desirability of each feature by giving me a number from one to five. Five means the feature is extremely desirable, three means it is somewhat desirable, and one means the feature is not desirable at all to you when you purchase food. If no single answer captures your feelings completely, please indicate the closest number. Please try to use all the numbers in the scale.”

Analysis of the mean ratings of the interval data in Table 7 indicates that there are many differences in the importance of individual characteristics to consumers in the U.S., Japan, and Italy. The superscripts show the ranking of the mean rating between countries for the attribute listed. The same superscript for two countries indicates there is no difference in the mean rating of the attribute between the two countries. For example, fresh looking is more important to consumers in the U.S. than to consumers in Italy and Japan. Fresh looking is equally important to consumers in Italy and Japan. Consumers in the U.S. indicate that a good value for the money is more important to them than consumers in Italy and Japan. Further, respondents from U.S. and Japan rated inexpensive as a more desirable characteristic of food than consumers from Italy. Such a finding is interesting since the sample of consumers from Japan and the U.S. have a higher income level (Table 17). The Italian consumers rate the environmental characteristics higher than consumers in the U.S. and Japan. The Italian consumers rate free of pesticides, good for the environment, grown in my local area, can be traced back to the processor and grower, and GMO free higher than consumers in the U.S. and Japan. Thus, it

appears that the U.S. and Japanese consumers are more concerned with freshness and value of food products while the Italian consumers are concerned about the environment and the source of the food.

Table 7 Desirability characteristics of food

| Food Characteristics | US^a | Italy^a | Japan^a | F |
|---|-----------------------|--------------------------|--------------------------|------------------------|
| fresh looking | 4.6909 | ¹ 4.26 | ² 4.1484 | ² 7.193** |
| fresh tasting | 4.6909 | ¹ 4.44 | ² 4.2656 | ³ 23.809** |
| high quality | 4.5428 | ¹ 4.295 | ² 3.6535 | ³ 59.415** |
| a good value for the money | 4.3909 | ¹ 3.72 | ³ 4.0313 | ² 46.189** |
| high in nutrition | 4.28 | ¹ 3.93 | ² 3.7559 | ² 22.471** |
| inexpensive | 3.7527 | ¹ 3.075 | ² 3.7266 | ¹ 30.564** |
| grown in my country | 3.6764 | 3.725 | 3.7063 | 0.101 |
| can be prepared quickly | 3.6491 | ¹ 3.405 | ² 2.9681 | ³ 15.705** |
| free of pesticides | 3.6436 | ² 4.225 | ¹ 3.874 | ² 18.634** |
| good for the environment | 3.5764 | ² 3.89 | ¹ 3.4016 | ² 8.279** |
| grown in my local area | 3.3418 | ² 3.855 | ¹ 3.1875 | ² 17.818** |
| safe for the workman | 3.3376 | 3.505 | 3.4766 | 1.543 |
| can be traced back to the processor and grower | 3.3164 | ² 3.58 | ¹ 3.0732 | ² 6.496** |
| gourmet ingredients | 2.8909 | ² 3.365 | ¹ 2.5556 | ³ 20.548** |
| irradiated to kill bacteria | 2.8355 | ² 1.95 | ³ 3.7583 | ¹ 79.453** |
| organically grown | 2.8309 | ² 3.05 | ¹ 3.1953 | ¹ 5.654** |
| GMO free | 2.7103 | ³ 4.065 | ¹ 3.7344 | ² 93.891** |
| grown using bio-technology | 2.1985 | ² 1.67 | ³ 2.8125 | ¹ 42.376** |
| genetically modified | 2.0348 | ² 1.58 | ³ 3.5159 | ¹ 127.086** |

** Significant at the .05 level * Significant at the .10 level ^aSuperscripts indicate differences at the .10 level based on Tukey Post Hoc test, different numbers indicate differenced. Same numbers indicate the same rating.

5. Meal and Food Purchasing Behavior

Table 8 shows whether consumers purchased organic products in the past year. In the attribute ratings, the Japanese and Italian consumers rate organic as more desirable than the U.S. consumer. A greater percentage of Japanese consumers purchased organic products in the past year. However, the U.S. and Italian consumers indicate a similar purchase incidence. Although the Japanese consumers were more likely to have purchased an organic product, Table 9 shows that the U.S. and Italian consumers purchased a greater variety of organic food products.

Table 8 Have purchased organic in the past year

| | COUNTRY | | | Total | Chi Square |
|-------------------------------|---------|--------|--------|--------|------------|
| | US | Italy | Japan | | |
| Have purchased organic | 66.20% | 63.00% | 75.80% | 66.90% | 6.04** |

** Significant at the .05 level

Table 9 Types of organic food purchased

| | COUNTRY | | | Total | Chi Square |
|--|--------------|---------------|-------------|---------------|-----------------|
| | US | Italy | Japan | | |
| Meats | 20.90% | 21.50% | 9.40% | 19.40% | 9.606** |
| Milk | 28.20% | 33.50% | 21.90% | 28.50% | 5.241* |
| Other dairy products (excluding Milk) | 23.80% | 28.00% | 6.30% | 22.20% | 23.576** |
| Fresh fruits | 62.2% | 44.50% | 39.8 | 10.40% | 31.426** |
| Fresh vegetables | 62.70% | 38.00% | 71.10% | 58.30% | 46.958** |
| Wine | 14.00% | 13.00% | 8.60% | 13.00% | 2.688 |
| Bakery items (Including bread) | 21.80% | 23.50% | 25.80% | 22.80% | 1.004 |
| Other | 16.90% | 16.50% | 8.60% | 15.60% | 5.61* |

** Significant at the .05 level

* Significant at the .10 level

United States consumers read the nutritional information label more often when making a decision to purchase. Consumers in the U.S. also rate the characteristic high in nutrition higher than consumers in the other countries. Approximately two-thirds of consumers from all countries read ingredient information labels often before purchasing a product.

Table 10 Frequency of reading labels for *nutritional information* when purchasing

| | COUNTRY | | | Chi Square |
|-----------------------|---------|--------|--------|------------|
| | US | Italy | Japan | |
| | | | | 87.422** |
| Not at all | 6.20% | 14.50% | 6.30% | |
| Not very often | 16.70% | 35.00% | 30.50% | |
| Somewhat often | 33.30% | 25.50% | 50.00% | |
| Very often | 43.80% | 25.00% | 13.30% | |

** Significant at the .05 level

Table 11 Frequency of reading labels for *ingredient information*

| | COUNTRY | | | Chi Square |
|-----------------------|---------|--------|--------|------------|
| | US | Italy | Japan | |
| | | | | 4.947 |
| Not at all | 9.30% | 9.00% | 6.30% | |
| Not very often | 24.50% | 30.50% | 26.60% | |
| Somewhat often | 34.50% | 32.50% | 39.10% | |
| Very often | 31.60% | 28.00% | 28.10% | |

** Significant at the .05 level

6. General Attitudes Toward Food and Meals

Respondents were asked how strongly they agree or disagree with a number of statements concerning food, government, and cooking. The following rating scale was used to evaluate these statements: strongly agree = 4; agree = 3; disagree = 2; strongly disagree = 1. Table 12 shows the mean ratings that are evaluated using a one-way analysis of variance and a Tukey post-hoc test. The superscripts show the ranking of the mean rating between

countries for the statement listed. Two countries with the same superscript imply there is no difference in the mean rating of the statement. For example, the Japanese consumer is less likely to agree with this the statement, *I trust government agencies in my country to insure food safety in the future*, while the U.S. and Italian consumers have the same level of agreement.

Both United States and Italian consumers are more likely to trust their government agencies about food safety for the future than Japanese consumers. Perhaps this is a result of the recent fraudulent labeling incidents in Japan. Japanese consumers believe preservatives are bad for their health, followed by Italian and American consumers. Italian and Japanese consumers consider pesticide use more dangerous for their health when compared to United States consumers. This is similar to the finding that Italian consumers rated *free of pesticides* as a more important attribute of food than United States consumers and Japanese consumers. Further, United States and Japanese consumers are more concerned about finding low prices for food products and they rated the food attribute, *inexpensive*, higher than the Italian consumers. United States and Italian consumers are more likely to agree that they have a sufficient amount of food of good quality than their Japanese counterparts. Japanese consumers are more likely to be concerned about the world food supply and the safety of food. Again, this may be a result of the recent labeling fraud experience in Japan. Italian and United States consumers lead a more "busy" lifestyle than Japanese consumers. This finding corresponds to the U.S. and Italian consumers rating the food characteristic *can be prepared quickly* more desirable than the Japanese consumers.

Since the Japanese consumers are more concerned about food security issues, it is not surprising that Japanese consumers are the most concerned about Mad Cow disease, followed by the Italian consumers, and lastly, the United States consumers.

Table 12 Level of Agreement

| | United States N=550 | Italy N=200 | Japan N=128 | F |
|---|--------------------------------|------------------------|----------------------------------|-----------|
| I trust government agencies in my country to insure food safety in the future | 2.8509 | ¹ 2.8 | ¹ 2.3543 ² | 18.161** |
| The pesticides that are used to grow food are dangerous for my health | 2.7945 | ² 3.245 | ¹ 3.3622 ¹ | 40.773** |
| The preservatives in foods are bad for my health | 2.7099 | ³ 3.19 | ² 3.3984 ¹ | 56.247** |
| The most important factor in deciding to purchase a food product is low price | 2.3473 | ¹ 1.785 | ² 2.4531 ¹ | 46.819** |
| My family always has a sufficient amount of food | 3.5909 | ¹ 3.315 | ² 2.6929 ³ | 110.157** |
| My family always has food of good quality | 3.4809 | ¹ 3.3 | ² 2.4016 ³ | 154.539** |
| I am very concerned about the world food supply for all countries in the next 10 years | 2.7945 | ³ 2.61 | ² 2.9922 ¹ | 8.066** |
| Recent events have made me very concerned about the safety of the food I eat | 2.6327 | ³ 3.045 | ² 3.1732 ¹ | 33.686** |
| I am very busy and have very little time to cook meals | 2.6259 | ¹ 2.65 | ¹ 2.3359 ² | 5.953** |

Table 13 Concern about Mad Cow

| | COUNTRY | | | Chi Square |
|-----------------------------|----------------|--------------|--------------|-------------------|
| | US | Italy | Japan | Total |
| Not at all concerned | 18.90% | 10.50% | 10.90% | 15.80% |
| Not very concerned | 35.30% | 25.50% | 15.60% | 30.20% |
| Concerned | 26.70% | 31.00% | 43.00% | 30.10% |
| Very concerned | 19.10% | 33.00% | 30.50% | 23.90% |

** Significant at the .05 level

7. Purchase Interest in Genetically Modified Food

The analysis of the interval, ratio, and nominal data has shown that there are many differences in behavior and attitudes toward food between the U.S., Japanese, and Italian consumers. A simple model is used here to examine these relationships. It should be noted that this model is not intended to predict purchase interest, since an interval scale is the dependent variable. The purpose of this model is to examine the direction of the relationship between the likelihood of purchasing a genetically modified food product, country, concern about mad cow disease, the desirability of organic food, age, frequency of reading ingredient labels, familiarity with genetically modified food, agreement that preservatives are bad for one's health, and concern about the world food supply.

Table 14 shows that very little is explained by the regression equation since the Adjusted R Square is 0.188. Thus, many factors other than those examined here explain why consumers have a positive attitude toward purchasing a genetically modified food product. However, the model does indicate that consumers in Italy are less likely to purchase a genetically modified food product. Further, concern about mad cow disease, preservatives in food, and the world food supply all have a negative impact on purchase interest in genetically modified food. In addition, consumers that indicate organic is an extremely or very desirable attribute have a negative impact on purchase likelihood for a genetically modified food product. However, the younger consumer, under the age of 25, is more likely to purchase a genetically modified food product. Consumers that are more familiar with genetically modified food are more likely to purchase it.

Table 14 Model Summary likelihood to purchase genetically modified food

| R | R Square | Adjusted R Square | Std. Error of the Estimate |
|------|----------|-------------------|----------------------------|
| .444 | .197 | .188 | .9313 |

Table 15 Analysis of Variance likelihood to purchase genetically modified food

| | Sum of Squares | df | Mean Square | F | Sig. |
|------------|----------------|-----|-------------|-------|------|
| Regression | 181.527 | 9 | 20.170 | 23.26 | .000 |
| Residual | 740.676 | 854 | .867 | | |
| Total | 922.204 | 863 | | | |

Table 16 Regression coefficients dependent variable likelihood to purchase genetically modified food

| | Unstandardized Coefficients B | Standardized Coefficients Std. Beta | t | Sig. | |
|--------------|-------------------------------------|---|--------|--------|------|
| (Constant) | 4.278 | .253 | 16.912 | .000 | |
| Mad Cow | -.111 | .035 | -.110 | -3.169 | .002 |
| JAPAN DUM | .123 | .100 | .042 | 1.227 | .220 |
| ITALY DUM | -.616 | .082 | -.251 | -7.510 | .000 |
| ORGANIC | -.154 | .072 | -.070 | -2.151 | .032 |
| UNDER 25 | .268 | .082 | .104 | 3.288 | .001 |
| INGREDIENT | -.117 | .036 | -.107 | -3.206 | .001 |
| FAMILIAR | .125 | .040 | .099 | 3.106 | .002 |
| PRESERVATIVE | -.211 | .045 | -.165 | -4.683 | .000 |
| WORLD FOOD | -.124 | .042 | -.102 | -2.993 | .003 |

a Dependent Variable: LIKELIHOOD TO PURCHASE GMO

8. Demographics

There are numerous differences in the demographics between samples in the three countries. The Japanese consumers are more likely to be females. The largest age group for all countries is 25 to 44 years. However, the U.S. sample has a higher proportion of consumers over 44 years old. The Japanese consumers are more likely to be married while the Italian sample has a large proportion of single consumers. The U.S. consumers are higher educated than the Italian and Japanese consumers. The Japanese consumers and the U.S. consumers have similar income levels and are equally likely to have children under the age of 18 in the home. The income level of the Italian sample is lower compared to the US and Japanese sample. However, the United States and Italian households are more likely to have children in the households while the Japanese and Italian households are larger. Additional research is needed to examine the impact of demographics on attitudes toward food within and between countries.

Table 17 Demographics

| | US | Italy | Japan | Total | Chi Square |
|---------------------------|--------|--------|--------|--------|---------------------|
| Gender | | | | | |
| Female | 57.20% | 55.00% | 73.20% | 59.00% | 12.693** |
| Male | 42.80% | 45.00% | 26.80% | 41.00% | |
| Age | | | | | |
| under 20 years | 2.20% | 4.50% | | 2.40% | 55.114** |
| 20 to 24 years | 21.30% | 17.00% | 3.10% | 17.70% | |
| 25 to 44 years | 36.70% | 47.00% | 49.20% | 40.90% | |
| 45 to 54 years | 23.10% | 17.50% | 21.10% | 21.50% | |
| 55 to 59 years | 6.50% | 5.00% | 18.00% | 7.90% | |
| 60 + | 10.20% | 9.00% | 8.60% | 9.70% | |
| Marital Status | | | | | |
| Married | 46.60% | 36.00% | 78.10% | 48.80% | 67.659** |
| Living with a partner | 14.90% | 13.50% | 0.80% | 12.50% | |
| Single | 29.30% | 42.50% | 18.00% | 30.70% | |
| Separated / Divorced | 5.60% | 4.50% | 1.60% | 4.80% | |
| Widowed | 3.50% | 3.50% | 1.60% | 3.20% | |
| Education | | | | | |
| Grade school or less | 0.70% | 24.00% | 2.30% | 6.30% | 341.75** |
| Some high school | 2.20% | 10.50% | 1.60% | 4.00% | |
| High school graduate | 12.90% | 31.50% | 53.90% | 23.10% | |
| Some college | 36.70% | 18.00% | 0.80% | 27.20% | |
| College graduate | 36.20% | 14.50% | 36.70% | 31.30% | |
| Post graduate work | 11.30% | 1.50% | 4.70% | 8.10% | |
| Employment Status | | | | | |
| Employed, full time | 62.10% | 70.00% | 63.90% | 64.20% | 11.209** |
| Employed, part time | 20.00% | 13.00% | 25.40% | 19.20% | |
| Not employed | 17.90% | 17.00% | 10.70% | 16.60% | |
| Income | | | | | |
| Under \$20,000 | 10.20% | 9.0 | 9.9% | 10.2% | 7.5161 ¹ |
| \$20,000 to \$29,999 | 11.5% | 37.2 | 14.0% | 12.0% | |
| \$30,000 to \$39,999 | 14.0% | 17.9 | 13.2% | 13.8% | |
| \$40,000 to \$54,000 | 17.9% | 14.1 | 24.8% | 19.1% | |
| \$55,000 to \$69,999 | 14.7% | 16.7 | 17.4% | 15.2% | |
| \$70,000 or more | 31.7% | 5.1 | 20.7% | 29.6% | |
| Children under 18 in home | 33.30% | 22.00% | 39.70% | 31.70% | 13.085** |
| People in household | 2.6685 | 3.085 | 3.3254 | | 16.498 |

** Significant at the .05 level *Significant at the .10 level ¹Chi-square between U.S. and Japan.

9. Conclusions

A comparison of the U.S., Italian, and Japanese consumer indicates that there are many differences in their demographics and their attitudes toward food, meals, and the use of biotechnology in food production. The U.S. and Japanese consumers have relatively positive attitudes toward genetically modified food, while the Italian consumer has a relatively negative attitude toward genetically modified food. Familiarity with genetically modified food has a positive effect on its acceptance and the Italian consumer is least likely to be familiar with genetically modified food. Further, a positive attitude toward organic food has a negative impact on acceptance of genetically modified food. The Italian consumers rate organic higher than the U.S..

The Italian consumers rate free of pesticides, good for the environment, grown in my local area, can be traced back to the processor and grower, and GMO free higher than consumers in the U.S. and Japan. The U.S. and Japanese consumers are more concerned with freshness and value of food products while the Italian consumers are concerned about the environment and the source of the food. The Japanese consumers are more concerned about food security issues and they are the most concerned about Mad Cow disease, followed by the Italian consumers, and lastly, the United States consumers.

This research has shown that there are many differences in attitudes toward food between countries and continents. More research is needed to understand the factors affecting those differences. However, it appears that the younger consumer is more willing to accept new technologies in food production and familiarity with new technologies has a positive impact on acceptance while concern for the environment has a negative impact on acceptance.

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