



Consumer Acceptance of Biotechnology in the United States and Japan

Japanese and

American consumers remain optimistic about biotechnology, but there are still opportunities for increased consumer education

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The benefits of food biotechnology have been promised for more than two decades. That promise is becoming reality. A growing number of farmers are raising corn, soybeans, and other crops developed through biotechnology that have the benefits of less pesticide use and higher yields. As with most commodities, these grains are generally blended into processed foods or animal feed.

Consumers will soon have the opportunity to buy fresher, more nutritious, and better tasting fruits and vegetables developed through biotechnology. Advances are also on the horizon for food ingredients and functional foods. Consumer acceptance of foods produced through biotechnology remains a very important issue for food scientists and others. This is particularly true for international markets (Hoban, 1997).

Biotechnology has recently been in the news in Europe, Japan, and elsewhere. Public debate over food biotechnology has arisen in Europe for a number of reasons, including insufficient consumer education programs. However, the Japanese and American markets have remained relatively calm as foods containing ingredients developed through biotechnology have begun arriving in stores. Private and public sector leaders need a better understanding of consumers' awareness and acceptance of biotechnology.

This article reviews trends in Japan and the United States to provide guidance for product development, marketing, and educational efforts. Given the growing

importance of export markets, particular attention will be paid to a recent survey conducted in Japan that replicates similar research conducted earlier.

Surveys Conducted

The most recent Japanese study involved 15- to 20-minute telephone interviews with a random sample of 1,000 consumers conducted in January 1998. The survey instrument was almost the same as the one used in fall 1995 (Hoban, 1996a). The cooperation rate was acceptable (approximately 60%). This compares favorably to the response rates typically achieved in the U.S. The sample for this study appears representative of the Japanese population. The sample, which included an equal number of men and women, also represents a broad cross-section of respondents in terms of their age, education, and employment status. The sample was generally quite comparable to the one used in the 1995 study.

In addition to comparing the results of the 1998 Japanese survey with the one from 1995, it is also possible to compare the Japanese results with survey results from the U.S. The International Food Information Council (IFIC) commissioned a national survey of U.S. consumers in March 1997 (Hoban and Katic, 1998). The results of the most recent Japanese survey will also be compared with other U.S. survey results, such as those obtained from the Food Marketing Institute (FMI, 1997) and some of the author's other work (Hoban, 1996b, 1998). For all these surveys, respondents' phone numbers were selected at random. Professional interviewers were used in all cases.

Table 1 Consumers' perceptions of food safety risks

Risk	United States (1997)	Japan (1998)
	N=1,011 (%)	N=1,004 (%)
Open-ended (unprompted)^a		
Pesticide residues	16	45
Additives or preservatives	2	34
Microbial contamination	69	7
Antibiotics or hormones	1	3
Irradiated foods	0	1
Biotechnology	0	1
Other	12	9
Closed-ended (prompted)^b		
Pesticide residues	66	80
Antibiotics or hormones	42	62
Irradiated foods	29	56
Additives or preservatives	20	52
Microbial contamination	77	49
Biotechnology	16	8

^a Numbers may not add up to 100% because of rounding
^b Multiple responses were accepted

Perceptions of Food Safety

Two questions were asked to determine what consumers thought were the most serious food safety risks (Table 1). For a top-of-mind or unaided opinion, respondents were first asked the following open-ended question: "What do you feel is the greatest threat to the safety of the food you eat?"

More than three-quarters of all Japanese consumers mentioned something to do with chemicals: pesticide residues; additives or preservatives; or antibiotics or hormones. Relatively few mentioned microbial contamination (including germs and spoilage). That is by far the most important food safety concern of American consumers. Only 1% of all Japanese respondents mentioned biotechnology (despite the fact that they had just been asked 10–15 minutes' worth of questions on that subject.) No one in the U.S. mentioned "biotechnology."

Respondents were also asked to respond to the following closed-ended or aided question: "I am going to read a list of food items that may or may not constitute a health hazard. For each one, please tell me if you believe it is a serious health hazard (3), somewhat of a hazard (2), or not a hazard at all (1)?"

The answers showed a similar pattern to the open-ended question for both the Japanese and U.S. consumers. However, when presented with a list of potential food safety risks, more respondents tended to express concern about each one. It is important to note that very few

consumers rated biotechnology as a serious health hazard, even when presented with that choice.

Awareness of Biotechnology

Awareness of biotechnology in 1998 remained fairly low among Japanese consumers. This is rather surprising given the increased media coverage in Japan and elsewhere since 1995. What is interesting is that awareness of traditional breeding was almost identical to awareness of bio-

technology. In both cases, fewer than 40% had heard some or a lot; the rest had heard only a little or nothing. Almost all respondents reported that they had heard only a little or nothing about herbicide-tolerant plants. Awareness of biotechnology in the U.S. had remained low for several years (Hoban, 1996b) but did rise significantly in 1997 with the media coverage of cloning (Hoban and Katic, 1998.)

Several other questions measured consumer awareness and understanding of biotechnology in 1998. Respondents were asked: "As far as you know, are there any foods produced through biotechnology in the grocery store now?" As in the U.S., 40% of all respondents correctly recognized that "yes," there are foods produced through biotechnology now on the market. In Japan, 21% said "no," and 39% said they "did not know."

To further determine how much of an

actual issue biotechnology represents, respondents were asked: "Before today, had you ever talked about biotechnology with someone?" Only one-third of all respondents had ever talked about biotechnology. This is much lower than in the U.S., where more than half of consumers in 1998 reported that they had talked about biotechnology. Those who had discussed biotechnology were then asked: "Had you talked about it frequently, occasionally, or only once or twice?" Only 4% of all the Japanese respondents had talked about biotechnology frequently; the rest had discussed it only once or twice (14%) or occasionally (15%).

Acceptance of Biotechnology

The majority of Japanese and American consumers remain positive about the use of biotechnology. About three-quarters of the Japanese consumers support the use of biotechnology in both medicine and agriculture (Table 2). Only one in five opposed either use of biotechnology. This level of Japanese support for agricultural biotechnology in 1998 remains higher than the American support. Support for both agricultural and medical biotechnology also increased in the U.S. during the past three years. Opposition to agricultural biotechnology in the U.S. dropped significantly.

Specific applications do vary in terms of their acceptability to Japanese consumers (Table 3). Respondents were asked: "On a scale of 1 to 10 (where 1 is unacceptable and 10 is acceptable) how do you feel about the use of biotechnology to make__?" [each of seven different applications was read]. Overall, Japanese consumers remain accepting or neutral on the specific products of biotechnology, but some decline is evident from the very high levels noted in 1995.

The most acceptable products were foods with lower fat or more vitamins, as

Table 2 Consumers' support for agricultural and medical biotechnology

Type of biotechnology and response	United States		Japan	
	1995 N=1,004 (%)	1998 N=1,067 (%)	1995 N=1,002 (%)	1998 N=1,004 (%)
Agricultural				
Support	66	72	82	75
Oppose	26	20	16	20
Don't know	9	8	2	5
Medical				
Support	83	90	87	71
Oppose	10	6	11	20
Don't know	7	5	3	9

Acceptance of Biotechnology

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well as crop plants that reduce the need for pesticides. These have a higher level of acceptance than traditional crop breeding. In fact, these are more acceptable than the use of biotechnology to produce human insulin and other medicines.

Three other products were also generally acceptable to consumers: farm animals that resist disease; enzymes used in food production; and higher-quality soy sauce or tofu. On the average, consumers tended to be less accepting when asked about food ingredients, such as flavorings. This pattern is very similar to what has been found in the U.S. (Hoban, 1996b).

One of the first agricultural biotechnology products approved for use in the U.S. and elsewhere are soybeans that are not damaged by a specific herbicide, *Round-Up*[®]. Japanese consumers were read the following statement: “*Biotechnology has also been used to develop soybeans and other crops that are not damaged by the use of selected weed control agents (such as Round-Up[®] herbicide). This gives farmers more options for controlling weeds.*” Even when this limited information was provided about herbicide-tolerant soybeans, consumers were significantly more receptive in 1998 than in 1995 (Table 4).

Consumers became even more positive when they received additional information. This increased acceptance was even more pronounced than in 1995. Learning that “*The weed control agents used with these soybeans have more positive environmental characteristics than do other products*” caused acceptance of these soybeans to rise significantly. The mean acceptance rating rose by one full point, and percent acceptance nearly doubled (representing a statistically significant increase).

When consumers were told that “*The MHW and the MAFF [Ministry of Health and Welfare and Ministry of Agriculture, Forestry, and Fisheries] confirm that these soybeans are safe and the same as others currently available,*” this led to a slight decrease in acceptance (which is quite different from the outcome in 1995). Acceptance rose again when respondents were told that “*Compared to*

Table 3 Japanese consumers' acceptance of crop breeding and various applications of biotechnology

Application	Response ^a			Mean score ^b
	Acceptable (%)	Neutral (%)	Unacceptable (%)	
CROP BREEDING				
1995	46	40	15	6.1
1998	40	44	16	5.9
BIOTECHNOLOGY APPLICATIONS				
Foods with lower fat or more vitamins				
1995	—	—	—	—
1998	46	31	24	7.3
Crop plants that reduce the need for pesticides				
1995	73	16	11	7.6
1998	55	19	26	6.3
Human insulin or other medicines				
1995	61	27	12	7.0
1998	40	33	27	5.7
Farm animals that resist disease				
1995	48	34	19	6.2
1998	34	32	34	5.3
Enzymes used in food production				
1995	41	39	20	6.0
1998	30	38	32	5.3
Higher-quality soy sauce or tofu				
1995	—	—	—	—
1998	29	33	38	5.0
Food ingredients, such as flavorings				
1995	30	39.4	31	5.2
1998	19	33.9	47	4.4

^aN=1,004 in 1995, N=1,002 in 1998

^bOn a scale of 1 = unacceptable to 10 = acceptable

other soybean varieties, farmers use less herbicide with these soybeans developed through biotechnology.”

Both Japanese and American consumers remain quite likely to purchase

produce items developed through biotechnology (Table 5). Respondents were read two similar questions: “*Biotechnology is being used to develop new varieties of produce, like tomatoes and potatoes, that*

Table 4 Japanese consumers' acceptance of herbicide-tolerant soybeans

Information given ^a	Response ^b			Mean score ^c
	Acceptable (%)	Neutral (%)	Unacceptable (%)	
Definition only: “Biotechnology has also been used to develop soybeans and other crops that are not damaged by the use of selected weed control agents (such as <i>Round-Up</i> [®] herbicide). This gives farmers more options for controlling weeds.”				
1995	17	35	48	4.3
1998	32	39	29	5.4
Above plus: “The weed control agents used with these soybeans have more positive environmental characteristics than do other products.”				
1995	31	36	33	5.2
1998	55	30	16	6.5
Above plus: “The MHW and the MAFF confirm that these soybeans are safe and the same as others currently available.”				
1995	39	35	26	5.7
1998	50	30	20	6.3
Above plus: “Compared to other soybean varieties, farmers use less herbicide with these soybeans developed through biotechnology.”				
1995	—	—	—	—
1998	58	27	15	6.7

^a Statements were cumulative, read in the order shown

^b N=1,004 in 1995, N=1,002 in 1998

^c On a scale of 1 = unacceptable to 10 = acceptable

taste better or fresher (are protected from insect damage and require fewer pesticide applications). The government has shown the produce to be safe. Would you be very likely, somewhat likely, not too likely, or not at all likely to buy these items?"

More than two-thirds said they would be likely to purchase produce that tastes better or fresher. A few more would be likely to purchase new produce varieties that are protected from insect damage and require fewer pesticide applications. These results are comparable to the results of a series of U.S. surveys, where a majority of consumers were likely to purchase these produce items.

Respondents were asked about their purchase of a processed food containing ingredients grown with biotechnology. This involved the following question: "Biotechnology has been used to protect plants, such as soybeans and corn, from insects with less use of pesticides. These crops are then used to produce foods like cooking oils which have the same taste, price, and nutrition as any other foods you are familiar with. If cooking oil made from these new plants was available, what effect would the use of biotechnology have on your decision to buy this cooking oil? Would this have a positive effect, a negative effect, or no effect on your purchase decision?"

In the U.S., 37% said the use of biotechnology would have a "positive effect," and almost 46% said such use of biotechnology would have "no effect" on their purchase of such oil. In Japan, the majority of consumers said the use of biotechnology would have either a positive effect (28%) or no effect (33%) on their purchase decision; 23% said it would have a negative effect; and 16% reported that they did not know what effect the use of biotechnology would have on their purchase decisions.

Implications

Overall, the results of these recent surveys are quite positive concerning continued acceptance of biotechnology by Japanese and American consumers. It is most significant that support for food biotechnology tends to be even higher in 1998 than in 1995. Japanese and American consumers are quite willing to purchase food items developed through biotechnology. The food and agricultural applications (insect-protected crops and more nutritious foods) are as acceptable as are new medicines.

Table 5 Consumers' willingness to purchase produce items developed by biotechnology

Willingness to purchase type of produce	United States			Japan	
	1995 N=1,012 (%)	1996 N=1,004 (%)	1997 N=1,018 (%)	1995 N=1,004 (%)	1998 N=1,002 (%)
Insect-protected					
Very likely	31	29	43	5	8
Somewhat likely	42	48	34	64	63
Not too likely	15	13	14	28	25
Not at all likely	9	9	9	3	4
Better tasting or fresher					
Very likely	20	17	22	4	8
Somewhat likely	42	41	40	59	62
Not too likely	23	27	20	34	26
Not at all likely	14	14	18	3	4

Japanese consumers' acceptance of herbicide-tolerant soybeans increased dramatically between 1995 and 1998. When given just a short definition, more than two-thirds are now accepting or neutral. Providing additional information on environmental benefits continued to cause a very significant increase in public acceptance. Government endorsement of safety did not cause an increase in acceptance, as it did in 1995. The use of biotechnology (with reduced pesticides) will generally have a positive effect or no effect on consumers' willingness to purchase cooking oil produced from insect-protected plants.

Awareness of biotechnology had risen among American consumers, but remains low among Japanese consumers. This low awareness is especially significant for the herbicide-tolerant varieties (which have clearly had more media coverage than they did in 1995). Japanese consumers are even less likely than their U.S. counterparts to have talked with anyone about biotechnology. Other results indicate that biotechnology has not (and likely will not) become an issue for the vast majority of consumers. When asked either to report the greatest threat to food safety (in an open-ended manner) or to rate a series of food safety hazards, biotechnology is seen as the least significant issue or concern.

Awareness and understanding of biotechnology among consumers are still low. This suggests a number of educational needs and opportunities. Most people want information about the benefits and safety of biotechnology, for both themselves and the environment. It will also be important to put biotechnol-

ogy in a historical perspective that considers the system that produces and distributes food. Consumers need to recognize that technology has played a vital role in food production for centuries.

Japanese and American consumers remain optimistic about biotechnology. Most will accept the products if they see a benefit to themselves or society. Most consumers will respond to foods developed with biotechnology the same way they do for any other food. Freshness, price, and quality will continue to be the major issues that consumers will (and should) consider when they decide which foods to buy. How seeds are developed will remain irrelevant for most consumers. Regarding biotechnology or any other new food technology, most consumers primarily want to know that someone they trust says, "The food is safe and nutritious." Scientifically sound regulations will allow consumers to receive the benefits of new technology while maintaining public health and environmental quality.

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