Enhancing Consumer Confidence in Agricultural Biotechnology and Genetically Engineered Food

by

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ENHANCING CONSUMER CONFIDENCE IN AGRICULTURAL BIOTECHNOLOGY AND GENETICALLY ENGINEERED FOOD

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ABSTRACT: This case study in risk communication describes a three-year trial of consumer acceptance of genetically modified food conducted on a commercial fruit and vegetable farm near Hillsburgh, Ontario, Canada. Beginning in spring 2000 through 2002, genetically engineered (GE) Bt sweet corn was grown beside conventional sweet corn. Information posters, letters, pamphlets, and press conferences provided the community with information on the project and the GE crops. The corn and potatoes harvested through the trial were segregated and labeled, and direct consumer testing for purchasing preference was conducted. The corn was clearly labeled as genetically engineered, and background information was provided on what "genetically engineered" meant. Overall, the Bt sweet corn outsold the regular sweet corn. This project highlights the importance of open and honest communication with customers in the introduction of new agricultural technologies and the importance of trust, especially in food producers. It also demonstrates that consumers can handle information about risks.

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Consumer acceptance of agricultural biotechnology and genetically engineered (GE) food is a complex issue involving many factors. Although North

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American surveys indicate that consumers have concerns about GE foods and are unwilling to purchase these products,[1] other studies indicate that consumer acceptance of GE foods would be based on the recognition of tangible benefits.[2]

However, two major issues that may hinder acceptance of GE technology are lack of trust in those responsible for the technology, including the government and scientists, and lack of knowledge and understanding about the technology. Surveys in North America and the U.K. suggest that perception of trust in government regulation and industry regarding pesticides[3] and GE agricultural products[4] is the strongest predictor of consumer support. People either trust that pesticides and agricultural biotechnology are adequately regulated or they do not. Those with low trust levels have the greatest concern about possible risks. Those with high trust perceive greater benefits from both products. Van Ravenswaay[5] concluded that trust in government and industry may be a more important influence on risk perception than the inherent safety or the danger of a particular pesticide or GE food.

A national Canadian survey[6] found that 25% of Canadians felt the government does a poor job managing biotech issues, 55% felt it was doing a fair job, and only 20% felt it was doing a good job. The survey noted that the public's view of government performance has eroded in recent years.[7] The results also suggested that Canadians were dissatisfied with the government's efforts at informing the public on the issue and wanted the government to toughen up the regulation of biotechnology.[8]

While levels of knowledge and understanding of agricultural biotechnology and GE foods remain low worldwide,[9] awareness has been steadily increasing.[10]

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1. Press Release, Ipsos-Reid, Canadian Awareness and Perceptions of Genetically Modified Foods (Jan. 23, 2000), *at* http://www.ipsos-reid.com/search/pdf/media/mr000123.pdf; EDNA F. EINSIEDEL, BIOTECHNOLOGY AND THE CANADIAN PUBLIC: 1997 AND 2000, at 16–21(2000); IPSOS-REID, NEW THOUGHTS FOR FOOD: CONSUMER PERCEPTIONS AND ATTITUDES TOWARD FOODS (2001).

2. *E.g.*, DECIMA RESEARCH, DECIMA RESEARCH REPORT TO CANADIAN INSTITUTE OF BIOTECHNOLOGY 8–9 (1993); INT'L FOOD INFO. COUNCIL, U.S. CONSUMER ATTITUDES TOWARD FOOD BIOTECHNOLOGY 5–6 (2003).

3. Kim L. Dittus & Virginia N. Hillers, *Consumer Trust and Behavior Related to Pesticides*, 47 FOOD TECH. 87 (1993).

4. *See, e.g.*, Lynn J. Frewer et al., *The Interrelationship Between Perceived Knowledge, Control and Risk Associated with a Range of Food-Related Hazards Targeted at the Individual, Other People and Society*, 14 J. FOOD SAFETY 19 (1994).

5. EILEEN O. VAN RAVENSWAAY, COUNCIL FOR AGRIC. SCI. & TECH., PUBLIC PERCEPTIONS OF AGROCHEMICALS 27 (1995).

6. Kathryn May, *Majority Immune to Biotech Health Scare: Poll: Willing to Take Risks*, NAT'L POST, July 24, 2000, at A1.

7. *Id.*

8. *Id.*

9. INRA (EUROPE)–ECOSA, THE EUROPEANS AND BIOTECHNOLOGY 25, 36, 38 (2000), *available at* http://europa.eu.int/comm/research/pdf/eurobarometer-en.pdf (last visited Nov. 11, 2003).

10. Press Release, Ipsos-Reid, Significant Knowledge Gap in Debate over Modified Foods: Most Concerned About Health and Safety Risks (June 8, 2000), *at* http://www.angusreid.com/MEDIA/dsp_displaypr_cdn.cfm?id_to_view=1039; EINSIEDEL, *supra* note 1.

Further, consumers report that most of their food-related information comes from television, newspapers, and other media outlets[11] but also report low levels of trust in these sources.

These findings suggest that efforts are needed to enhance consumer confidence and trust by providing tools to increase levels of knowledge and understanding of agricultural biotechnology and food production in general.

Frewer et al., in a study of food-related risks,[12] found that "[t]he most important determinant of gain or loss of trust in a source is whether the information is subsequently proven right or wrong [and] the source is subsequently demonstrated to be unbiased."[13] These researchers also found that admitting uncertainty or facilitating public understanding of science as a "process" could increase the communicator's trustworthiness.[14]

The research to date on public acceptance of GE foods is limited with respect to actual consumer behavior and response to communication efforts. Surveys that examined purchase intent are limited because consumers often say one thing and do another. For example, the predictions surrounding the introduction of recombinant bovine somatotropin before its actual supermarket availability in the U.S. in 1994 were inaccurate.[15] Consumption of fluid milk and dairy products in the United States increased 0.8% in the first year that recombinant bovine somatotropin was used on U.S. dairy farms. A supermarket test on irradiation found that consumers preferred the appearance of and purchased irradiated papaya over nonirradiated papaya in spite of consumer concern over irradiation technology.[16]

This paper describes a case study of a three-year project in risk communication in Ontario, Canada, on genetically engineered (GE) food. This project, called the Model Farm Project, was developed and implemented by the Food Safety Network (FSN) and involved producing and marketing genetically engineered Bt sweet corn and potatoes.[17] Bt sweet corn was genetically engineered to express the

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11. YANN CAMPBELL HOARE WHEELER, PUBLIC ATTITUDES TOWARD BIOTECHNOLOGY 7 (1999), *at* http://www.biotechnology.gov.au/library/content_library/BA_pYCHW.pdf [hereinafter YCHW]; VAN RAVENSWAAY, *supra* note 5; Lynn J. Frewer et al., *Genetic Engineering and Food: What Determines Consumer Acceptance?*, 97 BRIT. FOOD J. 31, 32 (1995); Linda Zimmerman et al., *Consumer Knowledge and Concern About Biotechnology and Food Safety*, 48 FOOD TECH. 71, 74 (1994).

12. L.J. Frewer et al., *What Determines Trust in Information About Food-Related Risks? Underlying Psychological Constructs*, 16 RISK ANALYSIS 473 (1996).

13. *Id.* at 476.

14. *Id.* at 484.

15. DOUGLAS POWELL& WILLIAM LEISS, MAD COWS AND MOTHER'S MILK 123–52 (1997). Recombinant bovine somatotropin is a growth hormone given to dairy cows to increase milk production.

16. Christine M. Bruhn & Jonathan W. Noell, *Consumer In-Store Response to Irradiated Papayas*, 41 FOOD TECH. 83, 84–85 (1987).

17. Bt is short for *Bacillus thuringiensis*, a common soil bacterium known for its insecticidal properties.

Bt protein in the plant tissues to protect the plant from the European corn borer without the use of chemical insecticides.

I. METHODOLOGY

A. Study Design

A case study is an empirical study that uses multiple sources of evidence to investigate a phenomenon within its real-life context. Case studies are often used when the phenomenon cannot be clearly separated from its context.[18]

This project was an illustrative case study used to examine the model farm project as a measure to enhance consumer confidence in agricultural biotechnology. Case study methodology was appropriate for this project because it allowed for the use of verbal narratives[19] and description of the chronological events of the program. There are different types of case studies including: illustrative, cumulative, exploratory, and critical instance case studies. Illustrative case studies have been used to describe a situation. This helps interpret other data, especially when there is reason to believe that readers know too little about a program. These case studies serve to help the unfamiliar become more familiar and to give readers a common language about the topic. Illustrative case studies have been used both in evaluations and historical food safety situations in the past.[20]

Triangulation is a process of using multiple perceptions to clarify meaning.[21] In triangulation, multiple qualitative data collection methodologies are used to examine the same phenomenon. Findings are corroborated in the hope that they will converge, decreasing the uncertainty of the interpretation. Because of the qualitative nature of this research, triangulation was used to verify the observations and interpretations. By using interviews, media content analysis, and a review of project documents, it was possible to build a case description of the model farm project. The main objective of this case study was to evaluate the Model Farm program on two levels: effectiveness and impact. According to Boulmetis and Dutwin,[22] effectiveness is "the degree to which goals have been reached" and impact is "the degree to which a program or project resulted in changes."[23]

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18. ROBERT K. YIN, CASE STUDY RESEARCH 23 (1994).

19. JAMES H. MCMILLAN, EDUCATIONAL RESEARCH: FUNDAMENTALS FOR THE CONSUMER 214–23 (1992).

20. *E.g.*, LOIS-ELLIN DATTA, U.S. GEN. ACCOUNTING OFFICE, CASE STUDY EVALUATIONS 37–40 (1991); J.J. Kastner & R.K. Pawsey, *Harmonising Sanitary Measures and Resolving Trade Disputes Through the WTO-SPS Framework. Part I: A Case Study of the US-EU Hormone-Treated Beef Dispute*, 13 FOOD CONTROL 49 (2002); J.J. Kastner & R.K. Pawsey, *Harmonising Sanitary Measures and Resolving Trade Disputes Through the WTO-SPS Framework. Part II: A Case Study of the US-Australia Determination of Equivalence in Meat Inspection*, 13 FOOD CONTROL 57 (2002).

21. MCMILLAN, *supra* note 19, at 222–23.

22. JOHN BOULMETIS & PHYLLIS DUTWIN, THE ABCS OF EVALUATION: TIMELESS TECHNIQUES FOR PROGRAM AND PROJECT MANAGERS 3 (2000).

23. *Id.* at 3.

B. Sources of Data

1. *Review of Project Documents*

The primary sources of data included press releases and internal proposal and summary documents. These were used to construct the case chronologically. In-depth interviews with Jeff Wilson, the producer who owns the model farm site, were used to verify findings and project description. Sales data on GE and conventional sweet corn from the farm market were gathered along with numbers of participants in on-farm activities to evaluate effectiveness of the program.

2. *Media Content Analysis*

The media content analysis was completed through a search of FSN's media article database[24] and the world wide web[25] and contained articles from Canadian and International newspapers, magazines, listserv postings, and website commentaries. The FSN archive was a convenient source for media tracking because FSN searches several news sources and websites each day as part of its media tracking and public perception of food safety research.

The world wide web search was conducted because the FSN archives were not sufficient to examine the reach of the model farm project. Websites not checked regularly by the FSN could contain content related to the project as well as listserv strings that show dialogue about the project. Stories were coded for the location of the source (international and national) and by whether it had a positive or negative connotation. When coding the articles, an article that criticized the research or researchers was coded as negative and an article simply reporting the project was coded as positive.

3. *Interviews*

Intercept interviews were conducted with consumers at the farm market who were given the option to purchase GE Bt sweet corn or conventional sweet corn. In-depth interviews were also conducted with Jeff Wilson. Interviews were scheduled for 1.5 hours and were planned for times that were most convenient for the interviewees. The style of interview was semi-structured with open-ended questions about the model farm's conception, implementation, and future. The primary organizer of the project was interviewed to verify program activities, goals, and target audience. Intercept interviews and consumer questions were analyzed using an open coding system[26] that identified topic, tone (positive or

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24. The FSN database can be found at http://131.104.232.9/search.html.

25. The search engine used for the Internet world wide web search was Google (http://www.google.com). The search terms used in the archive and Google searches were: "Birkbank Farms"; "Model Farm"; "Jeff Wilson" "Model Farm"; and "Powell" "Model Farm."

26. Open coding is the process of developing categories of concepts and themes emerging from data. It is an "open" process used to explore data without making any prior assumptions about what

negative), and themes. The intercept interviews are discussed in detail elsewhere.[27]

II. RESULTS AND DISCUSSION

A. Project Summary

Genetically Bt sweet corn and conventional sweet corn varieties were planted on Birkbank farms, a 250-acre commercial fruit and vegetable farm in Orton, Ontario, Canada, for three consecutive years. Each year, beginning in May 2000, the corn was planted in three different plantings to provide the continuity of supply to meet consumer demand for sweet corn throughout August and September. Plantings were designed to simulate commercial production conditions and each contained side-by-side blocks of both GE Bt sweet corn and conventional sweet corn. Planting locations changed each year according to the farm crop rotation plan.

Over the three years, three different varieties of Bt sweet corn (Attribute™) were planted, one yellow variety (GSO966) and two bi-color varieties (GSO977 and BC-0801). Two conventional varieties were also planted, one yellow (Jackpot) and one bi-color (Bi-Time). Agronomic details are reported elsewhere.[28]

In May of 2000, before the first planting of GE crops, letters describing the project were hand delivered to the neighbors of the farm. A community meeting was held before planting to inform the community of the project, address concerns and answer questions. Two members of the community attended the meeting. This suggested a high level of inherent trust in the local producer or little interest in the project from the community. It may also be a function of the project's openness. Because the farmers and researchers were open about growing GE crops and invited community members for consultation, it did not generate the concerns that would have prompted them to attend.

Each year, posters were placed in the Birkbank farm market announcing the project. On average, three press releases were posted in the *Canada News Wire* each year. Two press conferences were also held the first year and one each subsequent year. The first press release was posted after first planting and in conjunction with a press conference announcing the project. In all three years a second press release was posted halfway through the season and the third at harvest when there was corn available to sample.

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may be found. In traditional coding methods, assumptions are determined before content analysis begins.

27. Douglas A. Powell et al., Consumer Response to Genetically Engineered and Conventional Sweet Corn and Potatoes (2002) (submitted 2003, on file with author).

28. Douglas A. Powell et al., *A Comparative Analysis of the Agronomic, Economic and Consumer Considerations Regarding Genetically Engineered Bt and Conventional Sweet Corn and Table Potatoes on a Commercial Fruit and Vegetable Farm in Ontario, Canada*, 105 BRIT. FOOD J. (forthcoming 2003).

In June of 2000, a three-kilometer walking trail was developed and opened at the farm. The trail wound through the fields and a small wood lot and signs explaining various aspects of the farm operation were posted throughout. This was designed to open the fields and farm to the public and provide background information on agricultural practices and how the GE crops fit in to the operation. Jeff Wilson, owner and operator of Birkbank Farms, said that his customers had expressed interest in learning more about the farm operation and that the walking trail was a way to communicate "the challenges around the decisions that farmers have to make." Guided tours were also available and promoted each year.

In 2001, educational tours were developed for high school students. The tours consisted of a talk and lab activity, a tour of the farm and tasting of GE and conventional sweet corn and potatoes. In 2002, these tours were continued and a classroom was built in the barn to house students throughout the fall. A series of "family days" was held throughout the summer of 2002 to bring families to the farm. Educational activities were available for the children while the parents toured the farm and market.

The Bt and conventional sweet corn were harvested by hand and segregated in the field. The Bt sweet corn was kept separate from the conventional from field through to market.

Each fall, the sweet corn was available for purchase in the market at Birkbank farms, fully labeled, along with information on the number of sprays used and relative costs to produce. The two types of corn were presented in separate wooden bins labeled with either "Genetically Engineered Bt Sweet Corn" or "Regular Sweet Corn." The non-Bt corn was labeled as "Regular" as opposed to "non-Bt" or "Conventional" because previous focus groups had indicated that "Regular" was the clearest label. There were approximately 60 cm of space between the bins that was filled with corn bags and pamphlets to prevent the corn from inadvertently mixing. This display was set up the same way as the previous year but in a different location in the market. Employees in the market kept both corn bins filled to the same level throughout the day. The genetically engineered Bt corn and the conventional corn were both sold for the same price—$4.99Cnd/dozen. Pamphlets with background information about the project and Bt sweet corn were also available in the market.

On weekends when sweet corn was available for sale, free samples of both conventional and Bt sweet corn were available at the front of the market. A tasting booth was set up and a researcher prepared and provided samples while answering and recording questions. If customers did not have questions the researcher attempted to engage them in conversation by asking "have you heard about GE Bt sweet corn?" or "what have you heard about GE food or sweet corn?" The tasting booth was discontinued in 2002 as interest dropped.

B. Project Goals

An analysis of the project identified two different kinds of goals and three major activity types that were designed to engage consumers and members of the

community in discussion about the risks and benefits of GE food. The goals were broken down into program goals and research goals. The model farm project was simultaneously a research project and program. Program goals were: (1) to increase consumer knowledge and understanding of agricultural biotechnology, food production, and GE food and (2) to enhance consumer trust and confidence in the food production system and GE food. Research goals were: (1) to examine actual consumer decision making in a real purchase environment, (2) to assess consumer interest in Bt sweet corn, (3) to test consumer reaction to a labeled GE product, and (4) to test options for providing information. This case study examined only the program goals.

The three major activity types were used as units of measurements for the evaluation. These were:

1. Communication and promotion of the model farm in the media and the community via press release and media outreach, signs, posters, pamphlets, advertisements in local newspapers, bookmarks and the project website.
2. Market display of Bt sweet corn and conventional sweet corn and tasting display
3. Tours and walking trail to bring people on to the farm and actually show them the operation.

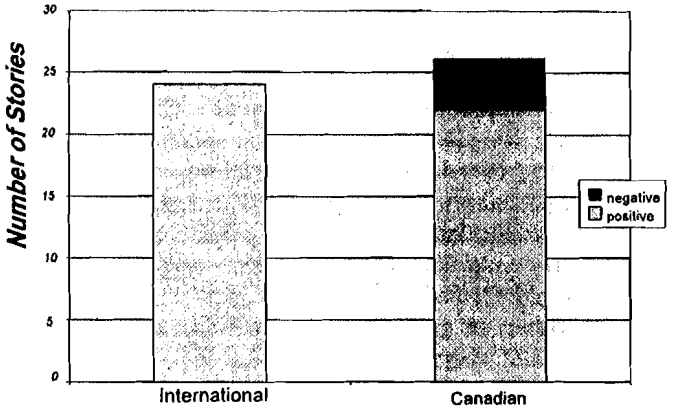
1. *Communication and Promotion*

A total of ten press releases were created and submitted to *Canada News Wire*, the national organization that handles the posting of group-based media releases. Forty-five articles were discovered through the FSN archives or through the word wide web; a similar number of the articles or reprint press releases were found in international sites (figure 1). It was found that some organizations and news websites would repeat segments of the press release instead of writing a separate story based on the releases. These were included as well because they were deemed to be indicators of reach. The foreign articles appeared in Brazil, Austria, Korea, and Africa. The remainder were found in Canadian sources. The coding of the stories indicated that all of the international coverage had a positive connotation. Four of the Canadian articles had a negative connotation (Figure 1).

Interest from local television and radio was also significant in the first year. Four radio and ten television news stories featured the model farm in 2000 compared to one and two television stories in 2001 and 2002 respectively and two television documentaries in 2001. Overall, media coverage of the project was highest in 2000 and tapered off dramatically in subsequent years.

The media outreach and promotion effectively brought people to the farm, and most participants actively sought out information on GE crops and agricultural practices. In 2000, 2001, and 2002, 500, 800, and 600 participants, respectively, toured the farm. According to Jeff Wilson, participants on the tours and customers in the market often mentioned seeing the farm on television or in the newspaper.

Figure 1. Project Media Coverage



The fact that media coverage of the project dropped indicates that as the project became more familiar, it generated less interest. Activist groups, including Greenpeace, showed no interest in the second and third year. In the first year there was some negative attention from these groups in the form of negative comments in press coverage. Ten Eyck[29] examined a phenomenon called the marginalization of food safety issues, where coverage tends to cluster around crisis situations. Coverage of food safety arises only when specific situations occur and contributes to the idea that food safety is a marginal topic. The researcher argued that different media outlets have been covering the same issues at the same time and that specific issues have been covered only within a specific time period. This idea of marginalization of food safety issues led the author to hypothesize that if a statistically significant majority of articles on an issue were published within a set period of 12 months, then the issue had been marginalized.[30] Although original coverage of the project was not sparked by a crisis, the fact that coverage was minimal in the second year may be a result of the fact that after 12 months the story was "old news." During the first year of the project, Percy Schmeiser[31] and Starlink[32] corn stories put agricultural biotechnology in the spotlight. Furthermore,

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29. Toby A. Ten Eyck, *The Marginalization of Food Safety Issues: An Interpretative Approach to Mass Media Coverage*, 84 J. APPLIED COMM. 29 (2000).

30. *Id.* at 32.

31. Adam Killick, *Farmer's Battle with Biotech Giant Monsanto Begins in Federal Court: Saskatchewan Man Accused of Using Genetically Modified Seeds Illegally*, NAT'L POST, June 6, 2000, at A2; Irene Marushko, *Farmer Battles Firm over Modified Seeds*, TORONTO STAR, June 3, 2000, at B5.

32. Randy Fabi, *Japan Buys U.S. Corn Despite Biotech Fears: Furor over Allergies Link: U.S. to Begin Testing to Keep Gene-spliced Variety out of Exports*, NAT'L POST, Nov. 8, 2000, at C15; Jae Hur, *U.S. Tries to Ease Corn Fears*, TORONTO STAR, Nov. 1, 2000, at F10.

overall media coverage of biotechnology rose to a peak at the end of 1999 and spring of 2000 and has since been leveling off.[33] This is a measure of the impact of the media activities. They generated sufficient coverage to marginalize the issue.

Media and website tracking also indicated a wide geographical reach. Half of the media stories and press releases were picked up internationally and visitors to the website were tracked from over 10 different countries including Australia, Germany, the United Kingdom, China and Singapore. Media outreach was effective in generating interest in the project internationally and locally as indicated by television and print coverage. The wide reach indicated a level of effectiveness in increasing knowledge of the project and GE food. This is important when considering that television and newspaper are consumers top source for food related information.[34]

An important aspect of this project was that although a relatively small number of people actually visited the farm, the wider reach of media and website provided a forum for interested individuals to gain information on GE food and crops and the project itself.

2. *Market and Tasting Display*

The market display with labeled sweet corn and background information was useful to some consumers as a source of information on the Bt sweet corn and food production in general. An analysis of consumer comments indicated that some consumers read the information available before making a choice while others did not notice the labels. The majority of consumers who noticed the label "genetically engineered" took time to take a pamphlet, read the signs, or ask an employee or researcher.

In the first year, 115 comments were recorded over 13 weekend days while free samples of both types of corn were being given away. The plurality, 29% of all comments recorded in the market, were positive towards Bt sweet corn. Questions made up the next largest component at 24%, and there were 22% negative and 22% neutral comments. Fifty per cent of all comments related to taste and quality, which was expected because the comments were often recorded while the respondents tasted the corn. Of the questions, most were general such as "What is genetically engineered?" and "Why is it genetically engineered?"

In the second year, there were more positive comments than the first year. In the second year, 36% of all comments were positive compared to 29% of all comments in the first year. Of the questions recorded, there was a higher number of specific questions in 2001. In the first year only 24% of the questions were about specific aspects of GE technology, whereas in the second year 50% of the

33. Powell et al., *supra* note 28.

34. YCHW, *supra* note 11, at 7; Frewer et al., *supra* note 11, at 32; Zimmerman, *supra* note 11, at 74.

questions addressed specific issues such as insect resistance, human health implications, nontarget insects and labeling.

Results from the intercept interviews showed that when asked whether they would buy or had bought GE corn, 69% of Birkbank Farm customers (n=34) said they would buy it and 26% said they would not. Of those who had heard or read about GE, 68% said they would buy it. When asked why they would buy, the top answers were taste, quality, and less pesticides; of those who would not buy the GE corn, the primary reasons were environmental concerns, health and safety, ethical reasons, and a perceived need for additional safety testing.

When asked whether they were more concerned about pesticides or genetic engineering, the majority (72%) felt pesticides posed more of a threat. Thirteen per cent were equally concerned about both, 5% were more concerned about genetic engineering and only 3% were not concerned about either. When examining the effect of attitude on the purchasing decision, 87% of those who said that GE was beneficial said they would buy genetically engineered foods, while 74% of those who said it was harmful said they would not buy them.

The signs above the corn display contained information on some advantages and disadvantages of Bt and conventional sweet corn. Although not all consumers had time to read all the information available, many said during the intercept interview that they appreciated that the information was available if they wanted it. It is impossible to determine how many consumers read the 4,000 pamphlets on Bt sweet corn and Bt potatoes that were distributed over the three years.

From the limited questionnaires, it appears that the majority of those who bought GE foods felt that they were beneficial in some way, while those who would not buy the Bt corn felt they were harmful. The percent of people who said they would buy or did buy Bt corn was slightly higher than the percentage of Bt corn sold compared to regular corn; however, many customers bought both types to evaluate differences for themselves, which may account for the difference.

The tasting display was an effective tool for engaging consumers in conversation about the sweet corn. It allowed customers to taste and see the Bt sweet corn before purchasing and allowed them to ask questions of the researchers. One consumer expressed appreciation that the researchers engaged them in two-way conversation and asked for opinions. Other customers, when asked to taste the corn said they trusted the farmer and did not desire a sample.

The farm market at Birkbank Farms is a small rural retail outlet with an established customer base. It appears that returning customers remembered the signs from the first year of the project because the number of general questions asked decreased in 2001. During 2001, more customers had questions about specific issues such as labeling, antibiotic resistance, and regulations. Regular customers, after seeing the display the first time and asking general questions, came back with more specific questions. This indicated that seeing the display may have prompted customers to try to find information on GE foods or at least discuss the technology with others.

In 2002, interest in tasting the corn dropped as the majority of regular customers had previously tasted the corn. However, despite the lack of tasting and

questions observed in the first two years of the project, purchasing patterns remained relatively consistent.

Sales numbers were consistent over the three years. The Bt sweet corn outsold the conventional by a margin of 3:2 in year one, 5:2 in year two, and just under 2:1 in year three. Actual sales numbers are shown in Table 1. Main reasons given by consumers for purchasing were taste, appearance, and reduced pesticide use. In 2001 the proportion of Bt corn sold may have been greater than it might otherwise have been because of increased worm pressure in the conventional corn that year.

Table 1. Sales of Bt and Conventional Sweet Corn from 2000–2002 (number of cobs)

Corn Type	2000	2001	2002
Bt Sweet Corn	8,160	10,380	11,700
Conventional Sweet Corn	5,430	4,350	6,660

No customers boycotted the market because of the GE products, but some refused to buy even the conventional sweet corn. Most of the negative comments were general comments that the individual was against genetic engineering of food. Other reasons given included human health impacts, environmental concerns, and insufficient regulation.

The qualitative comments and intercept interviews indicated that whether the corn was GE or sprayed with pesticides was not an issue to the consumers interviewed. They made their choice based on a number of other factors including taste, color, appearance, and worm damage. The interviews and the comments also indicated that for some customers at the Birkbank farm market, pesticide reduction was a tangible benefit. The main purpose of providing information on pesticides and GE was to "acknowledge levels of risk and concern." Surveys have shown that pesticide use is one of the top consumer food safety concerns.[35]

Perception of trust is related to open and honest communication about the nature of risks. Openly acknowledging consumer concerns and providing them with information did not "scare the consumers away" as predicted by some. Consumers bought both types of corn. In many cases the customers bought six ears of each type to take home and try indicating that in the end, their choice came down to personal preferences in terms of taste, price and other organoleptic qualities.

35. ENVIRONICS RESEARCH GROUP, 1998 SAFE FOOD HANDLING STUDY: A REPORT FOR CANADIAN FOOD INSPECTION AGENCY (1997), *available at* http://www.inspection.gc.ca/english/corpaffr/publications/1998environics/study_texte.shtml.

3. *Tours and Walking Trail*

Efforts to bring the public to the farm were measured by the number of participants and analysis of their interviews. Five hundred people toured, either independently or with a guide, the farm in 2000, 800 in 2001, and 600 in 2002. Visitors included students, teachers, politicians, consumers, researchers, and food industry professionals. In 2002, four "family days" were held at the farm. The first was well attended with eight adults and ten children participating. Participation was lower for the other two events indicating that promotional efforts were inadequate. A short questionnaire that was distributed after each tour evaluated the value of the tour to the participants. These questionnaires indicated the opportunity to talk with farmer Jeff Wilson about the food he grows and sells was the most valuable part of the tour.

In the fall 2001, high school classes from throughout southern Ontario were invited to the farm for a full-day field trip including a farm tour and talk, laboratory activity and tasting of Bt and conventional sweet corn and potatoes. Five hundred high school students participated, of which 455 were from the greater Toronto area. In 2002, 1000 high school students participated, 580 of whom were from the greater Toronto area. Greenpeace toured the farm in 2000 but did not launch a demonstration.

The interview with Jeff Wilson and comments from tour participants indicated that the tours provided a forum for discussion about the advantages and disadvantages of different production systems. Consumers could see pest problems and solutions, giving them greater context with which to better evaluate agricultural technologies such as GE, pesticides, and organic production.

The case study indicated that contrary to survey findings, many consumers will buy genetically engineered crops when given the choice in an actual purchase environment. The customers at Birkbank Farms, when presented with openly labeled GE product accompanied by efforts to engage them in conversation, could handle information about the risks of both pesticides and genetically engineered crops. In the end, it was not the GE technology or pesticides that influenced their decisions, but rather other factors relating to personal preference. This indicates a certain level of trust in the producer and perhaps the food production system in general. It was not possible to measure the extent to which the activities influenced trust since the regular market customers had high preexisting levels of trust in the farmer. Certainly the customers appreciated the effort made to be open about the project, even those who did not want to take time to ask questions, take a tour, or read the available information.

Similar experiences have been seen with irradiated food. Although surveys have shown consumers rated natural foods as safest and irradiated foods as

unsafe,[36] actual experience with promoting and selling irradiated meat products have been successful. A Minnesota meat company that began marketing and selling frozen irradiated meat patties in May 2000 reported a sales growth of 35% in 2001 compared to 25% in 2000.[37] Recent demand for irradiated meat products has also been experienced by Dairy Queen and Publix supermarkets.[38]

The generalizability of these findings is limited by the qualitative nature of the project and the fact that the participants were part of a small homogeneous group with high levels of trust in the farmer involved in the research. Although the scope of this project was limited, however, its reach was extended through media outlets and a website, reaching several different countries.

Appropriate risk management strategies, such as the honest communication with consumers about agricultural technologies that occurred in the model farm study, can enhance consumer confidence in the safety of the food supply. Producer-led risk management programs are active, demonstrate to consumers that producers are cognizant of their concerns about food safety, and show that those in the farm-to-fork continuum are working to reduce levels of risk.

36. *Id.*

37. MINNESOTA BEEF COUNCIL, UPDATED LIST OF RESTAURANTS AND RETAILERS MARKETING IRRADIATED GROUND BEEF, *at* http://www.iaea.or.at/icgfi/documents/rest-retailers-list.pdf (Oct. 28, 2002).

38. *Id.*