

## Consumer Demand Affects R&D, Adoption, and Marketing of GE-Derived Products

Investments in biotechnology-related research and development (R&D), the adoption of GE seeds, and the marketing of GE-derived products are all affected by consumer demand. While several surveys indicate that some U.S. consumers are concerned about GE food (table 4), these concerns have not had a large impact on the market for foods containing GE ingredients in the United States. In the European Union and a few other countries, consumer concern has resulted in substitution away from GE ingredients.

While opinion surveys give some indication of whether or not consumers are concerned about foods containing GE ingredients, they give little indication of the level of concern. Some researchers have attempted to quantify this concern through studies in which consumers are asked how much they would be willing to pay for foods made with GE ingredients, and for foods without GE ingredients. Researchers then use these data to measure whether or not there is a difference between these two hypothetical prices.

In most of these studies (table 5), consumers indicated that they were willing to pay more on average for GE-free foods or to avoid foods containing GE ingredients. However, in many of the studies, at least some consumers did not require a discount to buy foods containing GE ingredients, while some expressed that they would not be willing to buy foods containing GE ingredients at all.<sup>11</sup> Some respondents were willing to pay more for certain characteristics, such as improved nutrition and environmental benefits (Li et al., 2001; Lusk, 2003, Bocaletti and Moro, 2000).

While surveys and willingness-to-pay studies provide some insight into consumer opinion, they often do not reflect how consumers will behave in a real market situation when purchasing goods and services. Each food product has many characteristics, such as taste, color, and ripeness. The presence of a biotech-derived component is only one attribute. Empirically, it is difficult to determine what percentage of the price a consumer is paying for a specific characteristic. There are no published studies that indicate how many consumers have actually paid a premium to purchase non-GE goods, but there is some empirical evidence of the types of goods that are currently offered for sale to consumers. In the United States, many products contain GE ingredients, and the demands for these products apparently have been unaffected by negative opinions about biotechnology expressed in surveys. A few specialty brands are marketed as “GE free,” but they represent a small percentage of supermarket sales.<sup>12</sup> In some other countries, however, strong consumer demand for non-GE products has limited the availability of GE items (see box, “Biotech Product Differentiation: A Tale of Two Markets”).

<sup>11</sup>The amount that consumers indicate that they are willing to pay for a particular characteristic in a hypothetical situation is sometimes different from the amount that they actually pay when shopping (Lusk, 2003).

<sup>12</sup>In addition, organic foods are available. Use of any GE techniques bars a crop from being certified as organic. Although organic foods still have a small market share (1-2 percent) of total U.S. food sales, their sales have been rising at a rate of 20 percent annually (Dimitri and Greene, 2002).

**Table 4**  
**Surveys on consumer perceptions of foods containing GE ingredients**

Country/ Population	Surveyed by	Details
United States	Pew Initiative/Mellman Group, 2003, 2004	27 percent favor introduction of GE foods; 47 percent oppose. However, 64 percent disagree with the statement, “genetically modified foods should not be allowed to be sold even if the Food and Drug Administration believes they are safe,” and 28 percent feel that those foods should not be allowed, even if the FDA feels they are safe.
United States	Gallup, 2001	52 percent support the application of biotechnology; 38 percent oppose the use of biotechnology in food production.
United States	Hallman, 2004	47 percent approved or leaned toward approval of the use of GE to make plant-based foods, 41 percent disapproved or leaned toward disapproval, and 12 percent were unsure.
United States	IFIC, 2005	50 percent said likely to buy and 45 percent said not likely to buy GE produce modified to taste better or fresher; 64 percent said likely to buy and 32 percent said not likely to buy GE produce modified to require fewer pesticide applications.
Beijing, China	Hu and Chen, 2004	67 percent were concerned about biotechnology.
Nanjing, China	Zhong et al., 2002	40 percent would buy GE foods; 17 percent would not; 34 percent don't know.
Beijing, China, Shijiazhuang, China	Ho and Vermeer, 2004	40 percent were willing or rather willing to consume foods containing GE-based ingredients, 51 percent were neutral, and 9 percent were rather unwilling or very unwilling to consume the foods.
Flemish speakers in Belgium	Verdurme and Viaene, 2003	15 percent opposed to GE foods; 34 percent perceived small risks and small benefits; 26 percent perceived moderate risks and moderate benefits; and 23 percent perceived large benefits.
United Kingdom	2003 GE Public Debate Steering board	86 percent preferred not to eat GE foods; 8 percent happy to eat GE foods.

Source: Compiled by USDA's Economic Research Service.

**Table 5**  
**Willingness to pay for foods that do not contain GE ingredients<sup>1</sup>**

Country	Food	Study	Willingness-to-pay premium
United States	Vegetable oil	Tegene et al., 2003	In experimental auctions, consumers willing to pay 14 percent more for non-GE food.
United States	Potatoes	Loureiro and Hine, 2002	Customers willing to pay 5 percent more for non-GE food.
United States	Golden rice	Lusk, 2003	Customers willing to pay 93 cents for GE "golden rice" with added vitamin C, 65-75 cents for regular rice.
United Kingdom	All foods	Burton et al., 2001	Customers indicated willingness to increase food budgets by 26-129 percent to avoid GE foods.
Italy	*	Bocchetti and Moro, 2000	Consumers willing to pay a positive amount for GE attributes; 66 percent did not require a premium to consume GE foods.
United States, France, Germany, and United Kingdom	Beef fed with GE feed	Lusk et al., 2003	U.S. consumers willing to pay \$2.83 and \$3.31 per lb. to avoid GE; European consumers \$4.86 to \$11.01.
United States, United Kingdom	Breakfast cereal	Moon and Balasubramanian, 2001	Survey found 56 percent of UK consumers willing to pay a premium to avoid GE compared with 37 percent of U.S. consumers.
Norway, United States, Japan, Taiwan	Vegetable oil	Chern et al., 2002	Norwegian students were willing to pay \$1.51 (55-69 percent premium) per liter for non-GE vegetable oil, U.S. students were willing to pay \$1.13 (50-62 percent premium), Japanese students were willing to pay \$0.88 (33-40 percent premium), and Taiwanese students were willing to pay \$0.45 cents (17-21 percent premium).
China	Rice	Li et al., 2002	80 percent of consumers did not require a premium to purchase GE rice and on average were willing to pay a 38-percent premium on GE rice and a 16-percent premium for GE soy oil.
Norway	Bread	Grimsrud, et al., 2004	Consumers required discounts of 37-63 percent to buy GE bread; One-fourth willing to buy with no discount.
Australia	Beer	Burton and Pearse, 2002	Younger consumers would pay \$A 0.72 less and older consumers \$A 0.40 less for beer made with GE barley.
Canada	*	West et al., 2002	83 percent of consumers ascribed a lower value to several GE foods.
France	*	Noussair et al., 2004	35 percent of consumers were unwilling to purchase GE foods, and 42 percent were willing to purchase them if they were less expensive.
United States	Oil, chips, and potatoes	Rousu et al., 2004	Consumers reduced their demand by an average of 7-13 percent for each food product having 1 percent and 5 percent tolerance levels for GE material relative to GE-free food.

<sup>1</sup>See also Lusk et al. (2005), who summarize a set of 25 studies including 57 GE valuation studies and report that, on average, consumers are willing to pay a positive premium for GE-free foods.

\*This study did not focus on a specific food item.

Source: Compiled by USDA's Economic Research Service.

## Biotech Product Differentiation: A Tale of Two Markets

The introduction of genetically engineered (GE) crops has led food manufacturers to make a choice for each of their products: either pursue a non-GE strategy and market and produce a non-GE product, or source inputs based on cost and quality and market and produce an undifferentiated product.

If all manufacturers were to pursue a non-GE strategy, farmers would eventually abandon GE technologies and consumer choice would be restricted to potentially higher cost non-GE products. If manufacturers were to pursue an undifferentiated strategy, then farmers' use of the technology would be determined by production costs and consumers would be faced with markets in which they could not differentiate between GE and non-GE foods. If manufacturers pursue both strategies, some farmers would continue to use the technology while others would grow conventional crops to supply non-GE markets. In this scenario, consumers would have a choice between GE and non-GE food, at least for some products.

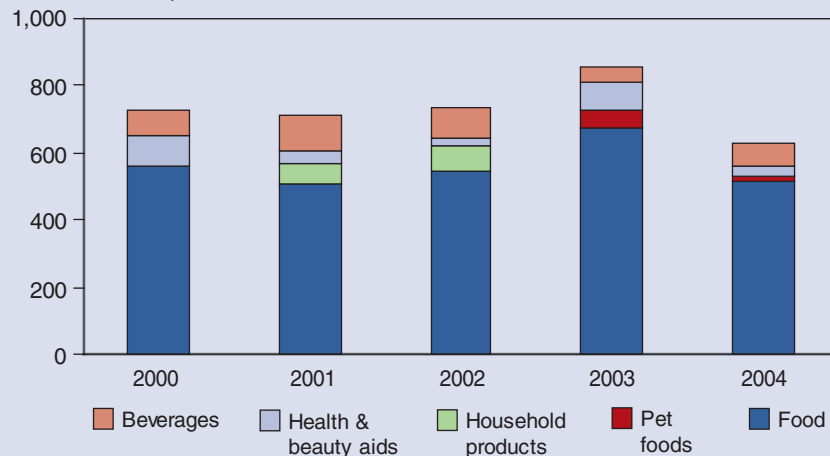
In the United States, where unlabeled foods may contain GE ingredients, the data show that manufacturers have been active in creating a market for GE-free foods. From 2000 to 2004, manufacturers introduced over 3,500 products that had explicit non-GE labeling, mostly food products, with annual totals ranging from 854 in 2003 to 631 in 2004. This is in addition to organic foods (organic crops may not be grown using GE techniques) (Dimitri and Greene, 2002).

In the European Union and Japan, where unlabeled foods cannot contain GE ingredients, manufacturers have chosen a non-GE marketing strategy. Very few products labeled as containing GE ingredients are found on European or Japanese grocery store shelves.

The data also show that there have been limited attempts to market GE products in the United States. There were far fewer new GE products introduced than new non-GE products, and most of the GE products were introduced in the 1990s. GE products included tomatoes (advertised as better tasting with a longer shelf life), canola oil (advertised as heat stable), shrimp (advertised as gourmet-quality), beef (low-fat), dietary supplements, cigarettes (low-nicotine), and a drain cleaner.

### Annual non-GE new product introductions in the United States

Number of new products



Source: Productscan Online.