I Will Not Eat It with a Fox; I Will Not Eat It in a Box: What Determines Acceptance of GM Food for American Consumers?

by Venkata Puduri, Ramu Govindasamy, John T. Lang, and Benjamin Onyango

Food biotechnology, also known as the genetic modification of plants and animals, is a scientific revolution with a potentially enormous impact on public life. Such technological advances rarely occur without public debate and these advances are no exception. Proponents view biotechnology in terms of its potential to improve food quality, enhance natural disease resistance, and reduce the use of chemical pesticides. Opponents cite ethical and moral concerns, as well as uncertain long-term impacts to the health of people and the environment.

Many in the food industry and government sector believe that public acceptance of biotechnology is critical for its future development. As a first step, therefore, increased consumer awareness through public education is desirable. Beyond educational efforts, however, it is important for industry and scholars to better understand which factors might influence consumer acceptance of biotechnology. Previous studies of American consumers suggest that acceptance is driven by knowledge and awareness of biotechnology and confidence and trust in the food system (Onyango & Nayga, 2004). Yet, it is not clear if there are any specific consumer benefits that Americans would readily accept.

Many American consumers support advances in biotechnology that result in food with beneficial traits. For example, American consumers would be interested in trying new varieties of fruits and vegetables that taste better or reduce the use of pesticides (Hoban, 1997; Hallman et al., 2002). Additionally, Americans generally support medical and crop biotechnology (Hoban, 1997; Hallman et al., 2002). However, Americans tend to support the use of biotechnology in plants more than in animals (Hallman et al., 2002, 2003, 2004). Furthermore, people with low trust in regulatory agencies have the highest concern about

possible risks regarding food biotechnology (Frewer, Shepherd, & Sparks,, 1994). Researchers, policy makers, and food producers would be wise to heed consumers' preferences for particular traits, plant-based GM, and the concerns regarding regulatory support when implementing plant and animal genetic modifications.

Data and Modeling

In 2004, The Food Policy Institute at Rutgers University fielded a nationally representative telephone survey of 1,200 noninstitutionalized adult Americans, yielding a ±4 percent sampling error rate. This survey data is the basis for our examination of the factors influencing respondents' approval of plant and animal genetic modifications. A logistic model framework is used to explore the relationship between socio-economic, demographic, and value attributes and the factors influencing respondents' approval of plant and animal genetic modifications.

Consumer Perceptions about Plant and Animal-Based Genetically Modified (GM) Foods

This analysis examined the influence of demographic variables, value attributes, and socio-economic status on the approval of plant-and animal-based GM. Demographic variables included sex, race/ethnicity, age, and level of education. Value attributes included knowledge about biotechnology, religious service attendance, self-reported political leanings, trust in the government, confidence in scientific institutions, skepticism about biotechnology companies, and confidence in the competence of government regulators. Socio-economic status was measured by self-reported household income. In general, the results indicate higher consumer support for plant-based rather

than animal-based GM foods. Overall, twice as many respondents (55%) approve of plant-based genetically modified foods compared to approval (27%) of animal-based genetically modified foods. While this result is consistent with other surveys, a closer examination of the data reveals more detailed insights and allows us to further characterize American acceptance.

Basic demographic variables revealed interesting opinions. Men were 20% more likely than women to support plant-based genetic modification and 16% more likely to approve animal-based genetic modification. Among Caucasians, more than half (58%) approved of plant-based genetic modification and one-quarter (27%) approved of animal-based GM. Among other ethnicities, about half (46%) approved of plant-based GM and one-quarter (26%) approved of animal-based GM. The logistic regression estimates show that Caucasians were 30% more likely than other ethnicities to approve of plant-based GM. A similar percentage of Caucasians were more likely than other ethnicities to approve of animal-based GM.

Among younger respondents (35 years old or younger), half (52%) approved of plant-based GM and one-quarter (24%) approved of animal-based genetic modification. Fifty-eight percent of middle-aged (35-54 years old) respondents approved of plant-based genetic modification and 28% approved of animal-based genetic modification. Among older respondents (55 years old and older), about half (54%) approved of plant-based genetic modification and one-quarter (27%) approved of animal-based genetic modification. According to logistic regression estimates, younger respondents were 15% less likely to approve
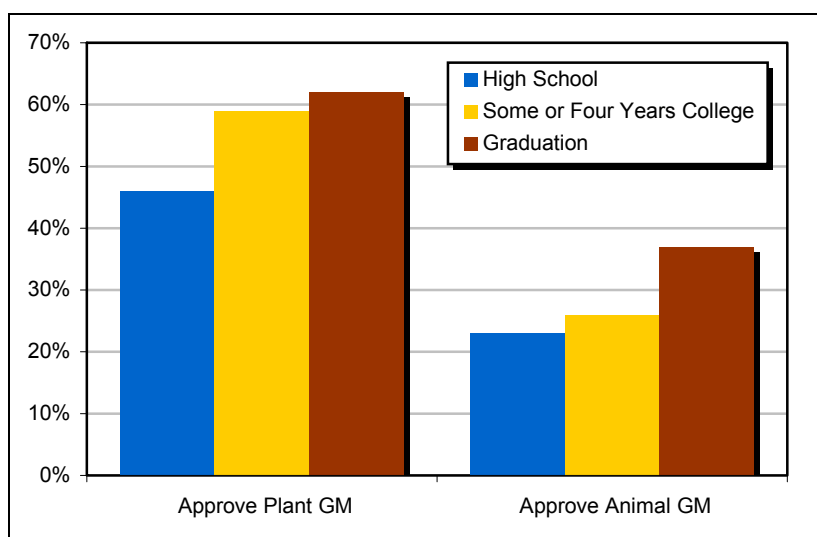
Figure 1. Respondents' opinion about approval of plant and animal-based GM food by their education.
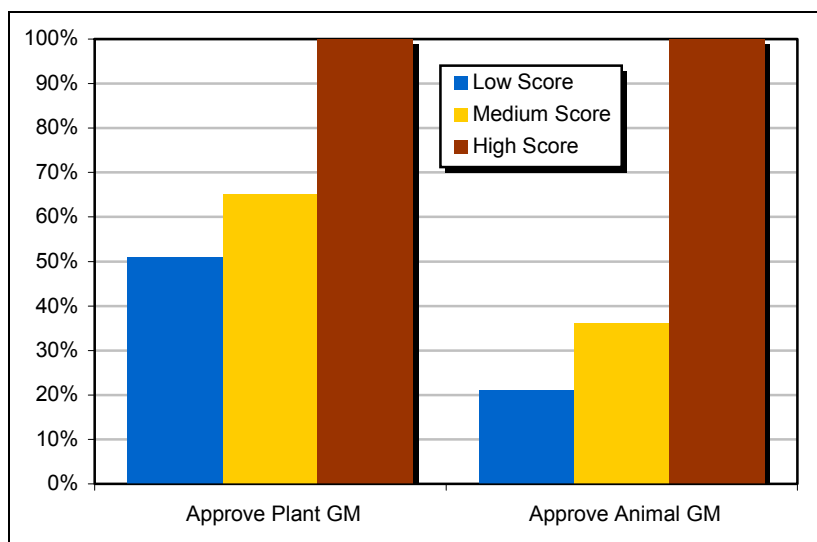
Figure 2. Respondents' opinion about approval of plant and animal-based GM food by their objective knowledge about genetically modified foods.

of animal-based genetic modification than the middle-aged respondents. The results suggest that non-Whites, the young, and women were less approving of either technology.

As seen in Figure 1, about two-thirds (62%) of college graduates approved of plant-based genetic modification and roughly one-third (37%) approved of animal-based genetic modification. Among those with at least some college education, 59% approved of plant-based genetic modification and 26% approved of

animal-based genetic modification. Among those with a high school diploma or less education, 46% approved of plant-based genetic modification and 23% approved of animal-based genetic modification. According to logistic regression estimates, those who have some college education are 27% less likely than college graduates to approve of plant-based genetic modification. This suggests that increased formal education increases approval of plant-based genetic modification.

In terms of value attributes, respondents' knowledge of biotechnology was assessed by asking 12 questions relating to biotechnology. Those who answered 1 to 5 questions correctly were classified as low scorers; those who answered 6 to 9 questions correctly were classified as medium scorers; and those who answered 10 to 12 questions correctly were classified as high scorers. As seen in Figure 2, all high scorers approved of plant- and animal-based GM. Among medium scorers, two-thirds (65%) approved of plant-based genetic modification and one-third (36%) approved of animal-based genetic modification. Among low scorers, half (51%) approved of plant-based genetic modification and one-fifth (21%) approved of animal-based genetic modification. According to logistic model estimates, low scorers were 20% less likely to approve of plant-based GM than medium and high scorers and were 14% less likely to approve of animal-based GM than medium and high scorers. This suggests that knowledge of biotechnology positively influences the approval of plant- and animal-based GM. In other words, the more a respondent knew about GM, the more likely they were to approve of its use.

More than half of self-declared liberals, centrists, and conservatives approved of plant-based GM. In contrast, less than one-third of these respondents approved of animal-based GM. Yet, according to logistic regression estimates, liberals were 15% more likely to approve of animal-based genetic modification compared to centrists and conservatives.

As seen in Figure 3, among respondents who never attend religious services, two-thirds (66%) approved of plant-based genetic modification and one-third (32%)
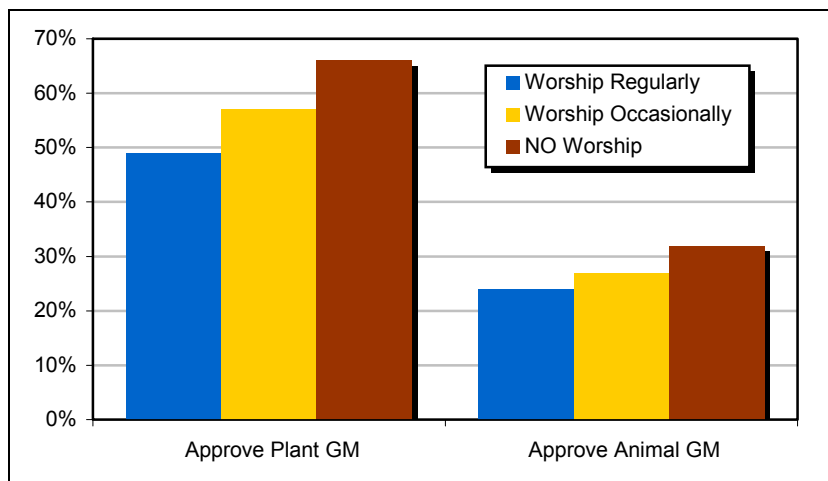
Figure 3. Respondents' opinion about approval of plant and animal-based GM food by those who attend church or other house of worship.
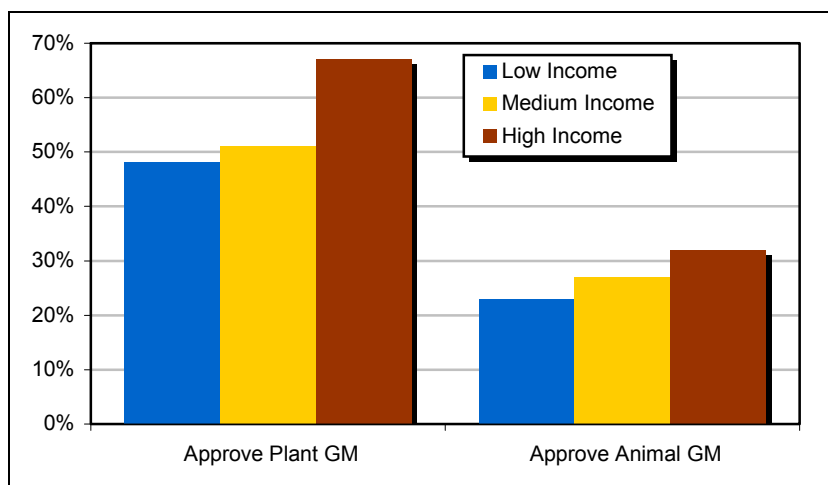
Figure 4. Respondents' opinion about approval of plant and animal-based GM food by their income.

approved of animal-based genetic modification. Among people who attend services occasionally, more than half (57%) approved of plant-based genetic modification and one-quarter (27%) approved of animal-based genetic modification. Among respondents who attend religious services regularly, roughly half (49%) approved of plant-based genetic modification and one-quarter (24%) approved of animal-based genetic modification. Logistic regression estimates showed that those who never attend religious services were 37% more likely than those who attend services regularly to approve of plant-

based genetic modification. The results suggest the less one visits a place of worship, the more approving of biotechnology.

Among respondents who say they trust scientific institutions, three-quarters (78%) approved of plant-based genetic modification and 39% approved of animal-based GM. Among respondents who say they trust the government, three-quarter (76%) approved of plant-based GM and 38% approved of animal-based GM. Among respondents who have confidence in regulators, less than two-thirds (63%) approved of plant-based GM and one-third (32%)

approved of animal-based GM. According to logistic model estimates, respondents who trust the government (29%), respondents who have confidence in scientific organizations (66%), and respondents who have confidence in the ability of regulators (28%), were more likely to approve the plant-based genetic modification. Respondents who trust scientific institutions were 30% more likely to approve of animal-based genetic modification. This suggests that those who trust key stakeholders are more likely to approve of plant-based genetic modification. Furthermore, those who trust science and its institutions are even more likely to extend that trust to animal-based GM.

As shown in Figure 4, among respondents with high household income (above $75,000), 67% approved of plant-based genetic modification and 32% approved of animal-based GM. Among respondents with a moderate household income ($35,000 - $75,000), 51% approved of plant-based genetic modification and 27% approved of animal-based genetic modification. Among respondents with low household income (below $35,000), 48% approved of plant-based GM and 23% approved of animal-based GM. Logistic regression estimates show that the low income group was 27% less likely, and the moderate income group was 25% less likely, to approve of plant-based genetic modification compared to the high income group. The low income group was 11% less likely than the moderate income group to approve of animal-based genetic modification. The results suggest the higher the household income, the more approving of biotechnology.

Concluding Remarks and Policy Implications

This article suggests differential acceptance and approval of genetic modification involving plant or animal genes. The results can contribute to our understanding of GM food acceptance and be used to derive marketing strategies and in policy formulation. Similar to previous studies, this article suggests that demographic, socio-economic, consumer value attributes, and trust in key stakeholders help drive acceptance of genetic modification (Onyango & Nayga, 2004). In general, the public is more approving of plant-based GM than animal-based GM. Furthermore, the results of this survey suggest that a better understanding of biotechnology, trust in the GM regulatory framework, and biotechnology corporations' motives are critical for the acceptance of genetic modification. A general outreach program to educate and inform consumers about biotechnology will not help the public make informed decisions about the desirability of this technology. Rather, a targeted communication strategy that takes all these differences between the consumer segments would be more effective. Additionally, the pursuit of a trustworthy corporate and industry-wide image would help assure consumers that biotechnology is, perhaps, a technology that is worth the risk.

For More Information

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