

# WHOM DO YOU TRUST? THE INFLUENCE OF CULTURE, GENDER AND GEOGRAPHY ON CONSUMER PERCEPTIONS OF GMO-LABELED PRODUCTS

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## Abstract

*This study was designed to describe and determine the effect of demographic variables, including gender, ethnic background and urban/rural geographic location, on consumers' trust and acceptance of agricultural biotechnology. To conduct the study, a sample population was drawn from three geographically and ethnically diverse locations and a survey questionnaire was administered in an attempt to measure respondents' attitudes, perceptions and intent to purchase GMO labeled products.*

*Results indicated that although most of the subjects surveyed for this study thought GMO food items should be labeled, more than half of the sample indicated they would consider purchasing foods labeled as GMOs. Whether or not subjects would consider purchasing GMOs, however, depended on their ethnic background, gender, and geographic location. Males and non-Hispanic whites were most likely to consider buying GMOs and more than half of the Hispanics would also consider buying GMOs. Most non-Hispanic blacks, however, reported they would not consider buying GMOs.*

## **Introduction**

Agricultural biotechnology is acknowledged as having great potential to increase global productivity of food and fiber systems while reducing negative environmental effects. In the past three years, after two decades of intensive research and development, cultivation of transgenic plant varieties has expanded greatly (James, 1999). In 1999, it is estimated that 40 million hectares of land were planted with more than 20 transgenic crop varieties. In fact, the value of the global market in transgenic crops grew from U.S.\$75 million in 1995 to U.S.\$1.64 billion in 1998 (Persley & Seidow, 1999). It is estimated that 88% of these crops were grown in the U.S., representing a major investment in agricultural biotechnology by American agriculture.

In conjunction with this growth in production, however, challenges to the use of biotechnology in agricultural systems have steadily increased in Europe, Asia and the developing nations, subsequently affecting international trade markets for U.S. crops. Opposition has also occurred in the U.S., both from activist organizations and from food processing and food service companies, such as Frito-Lay, Gerber and McDonald's, refusing to buy genetically modified crops (Frankenfood Frenzy, 2000).

Studies of consumer perceptions of agricultural biotechnology indicate acceptance varies from country to country, and is known to be impacted by such factors as age, socio-economic status, political affiliation and food application/type (Zepeda & Douthitt, 1999; Vestal & Briers, 2000). Men are generally more supportive of biotechnology than women, and those with formal education are also more likely to favor it (Hoban, 1998). Geography, culture and ethnic heritage, as specific aspects of nationality, may also be related to differences in consumer reactions to biotechnology. In a study of New Jersey residents, Hallman & Metcalf (1995) found that while most of the American public's information about biotechnology comes from the mass media, their level of trust in what they learn is relatively low. Gaskell, Bauer, Durant & Allum (1999), studying differences between European and U.S. acceptance of biotech foods, argued that the influence of three factors—difference in press coverage, trust in regulatory procedures and level of knowledge—might account for the relatively greater European resistance to agricultural and food biotechnology.

Zechendorf (1998), theorizing about European cultural differences with respect to this issue, argued that the more overtly visible factors that differentiate a country's acceptance, such as level of activism and regulation/policy decisions, might be symptoms of deeper-lying cultural differences. Looking at behavioral and cultural differences among different regions of Europe, he indicated some interesting differences in consumer awareness and acceptance between northern countries (Netherlands, Denmark, Sweden, the UK, Germany and Switzerland) and the southern countries (Italy, Spain, Portugal, Greece, France and Belgium) based on differences in cultural and religious heritage.

Northern countries (primarily Germanic or mixed Germanic/Romanic heritage) tended to be more aware of biotechnology and the least convinced of its benefits (Zechendorf, 1998). Culturally speaking, these countries tended to be highly urbanized and overwhelmingly Protestant; in addition, northerners tended to trust information from alternative sources, such

as consumer organizations and environmental groups. Zechendorf characterized northern Europeans as having to be convinced that a new food has a compelling benefit before accepting it; they also tend to prefer “natural” food, which they link to health, quality, and taste (Hamstra, 1991). Southern Europeans, (primarily Romance-language, traditionally Catholic heritage) on the other hand, were characterized as being less urban, aware of biotechnology, and somewhat more accepting, perhaps due to differing perceptions of governmental authority. For southerners, Zechendorf argues, taste is more important than quality and safety of food, and concern over health aspects is, as a result, fairly low.

In addition to geography and cultural beliefs, trust is one of the key factors that may influence acceptance of genetically modified foods (GMOs) as well as interact with demographic factors. Research indicates that trust in government and industry regulatory procedures may be key to consumer acceptability of agricultural biotechnology. Gaskell and his colleagues (1999), who conducted surveys of attitudes in Europe and the United States, found that textbook knowledge of biology and science did not explain the greater acceptance among U.S. consumers; Europeans scored significantly higher than Americans on knowledge. The researchers did find, however, that Americans rated their trust in national government agencies considerably higher than did Europeans. Ninety percent of Americans indicated they would have trust in USDA (United States Department of Agriculture) statements about the safety of biotechnology and 84% had trust in similar statements issued by the FDA (Food and Drug Administration). In contrast, Europeans indicated that they would have the most trust in statements issued by environmental, consumer, and farming organizations, respectively. Only 4% of European respondents indicated that they would have the most trust in statements issued by national public bodies.

Although current research indicates that trust in government, industry, and regulatory procedures may be a likely determinant of consumer acceptance of agricultural biotechnology, research also suggests that trust may be affected by demographic factors such as gender. In studies conducted to develop a model of gene technology acceptance, Siegrist (1999) found that trust had a strong and significant causal effect on perceptions of risk. In addition, he found significant gender differences; females had a significantly lower level of trust in gene technology than did males, as well as a lower judgment of the perceived benefits and acceptance of GMOs (Siegrist, 2000).

### **Purpose and Objectives of the Study**

The goal of this research is to develop a better understanding of those factors which may impact consumers' trust and acceptance in new technologies when applied to food, with the aim of developing better strategies for alleviating public concerns based on cultural differences. Based on the above, the objectives of this study are as follows:

- 1) Determine the effects of various demographic variables, including urban/rural geographic location, ethnicity and gender, on a sample of U.S. based consumers' acceptance of biotechnology.
- 2) Determine the effects of urban/rural geographic location, ethnicity and gender on U.S. based consumers' perceptions of trust with respect to the various groups and organizations involved in the biotechnology debate.

## Methods

Subjects were drawn from a sample population ( $N = 381$ ) of college students located at three different universities representing a mix of divergent geography, cultures and ethnicities. For the purposes of the study, students at Kansas State University represented a fairly rural population, while students at Florida International University were primarily commuter students living in Miami. Students at the University of Florida represented a mid-point between these two more extreme urban and rural populations. To conduct the study, subjects were directly administered a survey questionnaire designed to measure subjects' attitude toward labeling GMOs; their attitude toward purchasing GMOs; and their level of trust in the following six groups: local farmers, companies that produce GMOs, the USDA, the FDA, CES (Cooperative Extension Service), and environmental groups. The research design was a 2 (subjects' gender: male, female) X 3 (subjects' ethnicity: non-Hispanic white, non-Hispanic black, and Hispanic) X 3 (location of the university where the study was conducted: University of Florida, Kansas State University, and Florida International University) factorial.

All dependent measures were assessed with standardized scale items drawn from Hallman & Metcalf's (1995) attitudinal study of New Jersey based consumers. The wording of these items was changed slightly to focus on agricultural biotechnology rather than "genetic engineering." Additionally, Hallman & Metcalf (1995) used the term "faith" in the wording of their items; "trust" was substituted for faith in this study to directly focus on the issue of consumer trust.

## Findings

Subjects ( $N = 381$ ) were 34.1% male ( $n = 130$ ) and 65.4% female ( $n = 249$ ) (two subjects did not indicate their gender). The sample was divided into three categories of ethnicity: non-Hispanic white ( $n = 252$ , 68.3%), non-Hispanic black ( $n = 24$ , 6.5%), and Hispanic ( $n = 68$ , 18.4%). Two separate survey items assessed race and Hispanic origin according to the format of the 2000 U. S. Census. Out of 80 Hispanic subjects, 38 indicated they were white, 1 was Filipino, and the remaining 41 subjects did not answer the race question. For the purposes of this study, therefore, a single "Hispanic" category was created. Twenty-five subjects were not classified by ethnicity for data analysis; these subjects were non-Hispanic and were races other than black or white. An additional twelve subjects did not answer either the Hispanic origin or race question. Data was collected at the University of Florida ( $n = 141$ ), Kansas State University ( $n = 120$ ), and Florida International University ( $n = 83$ ).

### Objective One

In response to the question, "do you think that fruits or vegetables or other foods created through agricultural biotechnology should have special labels on them", 85.1% of subjects ( $n = 292$ ) replied "yes" while 14.9% ( $n = 51$ ) replied "no". Response to this item was not significantly affected by ethnicity, gender, or urban/rural geographic location (all  $\chi^2$  tests were non-significant at alpha of .05).

In response to the question, "if you were shopping for food and you saw some items that

were labeled as GMOs, would you consider buying them”, 63.3% of subjects ( $n = 216$ ) replied "yes" and 36.7% ( $n = 125$ ) replied "no". Response to this item was significantly affected by ethnicity ( $\chi^2 (2) = 12.9, p < .002$ ), gender ( $\chi^2 (1) = 6.7, p < .01$ ), and location ( $\chi^2 (2) = 18.9, p < .0001$ ). Non-Hispanic whites and Hispanics were more likely to report that they would consider buying food labeled as GMOs (68.0%,  $n = 170$ , and 56.7%,  $n = 38$ , respectively) than that they would not consider buying food labeled as GMOs. Non-Hispanic blacks, however, were more likely to report that they would not consider buying foods with a “GMO” label than that they would: 33.3% ( $n = 8$ ) answered "yes" while 66.7% ( $n = 16$ ) answered "no" (see Table 1).

Table 1. Number of Subjects in Each Ethnic Group Who Would (“Yes”) and Would Not (“No”) Consider Purchasing Foods Labeled as GMOs.

Ethnicity	Yes	No
Non-Hispanic White	170 (68.0%)	80 (32.0%)
Non-Hispanic Black	8 (33.3%)	16 (66.7%)
Hispanic	38 (56.7%)	29 (43.3%)

The significant effect of gender on attitude toward purchase was due to the fact that men were more likely to report that they would consider buying GMOs (70.8%,  $n = 92$ ) than women (57.1%,  $n = 140$ ) (see Table 2).

Table 2. Number of Men and Women Who Would (“Yes”) and Would Not (“No”) Consider Purchasing Foods Labeled as GMOs.

Gender	Yes	No
Men	92 (70.8%)	38 (29.2%)
Women	140 (57.1%)	105 (42.9%)

Finally, urban/rural geographic location also affected attitude toward purchase: subjects at Kansas State University were most likely to consider purchasing GMOs (72.0%,  $n = 95$ ), followed by subjects at the University of Florida (63.2%,  $n = 98$ ), while subjects at Florida International University were least likely to consider purchase (43.3%,  $n = 39$ ) (see Table 3).

Table 3. Number of Subjects in Each Location Who Would (“Yes”) and Would Not (“No”) Consider Purchasing Foods Labeled as GMOs.

Location	Yes	No
U. of Florida	98 (63.2%)	57 (36.8%)
Kansas State U.	95 (72.0%)	37 (28.0%)
Florida International U.	39 (43.3%)	51 (56.7%)

## Objective Two

Subjects were asked, “How much trust would you have in statements about agricultural biotechnology from each of the following sources?” The message sources listed included the USDA, FDA, CES, local farmers, companies that produce GMOs and environmental groups. The response scale provided for each message source was a seven-point differential ranging from “not at all trustworthy” to “very trustworthy” with “don’t know” as an additional response option. The most trusted source was the FDA ( $\bar{M} = 5.7$ ,  $S.D. = 1.3$ ) followed by the USDA ( $\bar{M} = 5.5$ ,  $S.D. = 1.4$ ), CES ( $\bar{M} = 4.2$ ,  $S.D. = 1.4$ ), local farmers ( $\bar{M} = 4.2$ ,  $S.D. = 1.6$ ), environmental groups ( $\bar{M} = 4.0$ ,  $S.D. = 1.8$ ), and companies that produce GMOs ( $\bar{M} = 3.1$ ,  $S.D. = 1.5$ ) (see Table 4). The means for the FDA, USDA, and companies that produce GMOs were significantly different from every other mean ( $p < .001$ ). The means for CES and environmental groups did not differ significantly from the mean for local farmers ( $\alpha = .05$ ) but were significantly different from each other.

Table 4. Mean Trust for Sources of Statements about Agricultural Biotechnology

Statement Source	<u>Mean</u>	<u>S.D.</u>	<u>n</u>	“Don’t Know” ( <u>n</u> )
FDA	5.7	1.3	376	4
USDA	5.5	1.4	367	12
CES	4.2	1.4	209	170
Local farmers	4.2	1.6	356	24
Environmental groups	4.0	1.8	353	27
Companies that produce GMOs	3.1	1.5	337	43

There was also considerable variation in the number of people who replied “don’t know” for each message source. In particular, 170 subjects replied “don’t know” for “Cooperative Extension Service.” Additional analyses were conducted to determine if ethnicity, gender, or urban/rural geographic location affected whether subjects provided an indication of trust in the CES or responded “don’t know.” Location was the only factor that had a significant effect on whether subjects rated their trust in CES or marked “don’t know” ( $\chi^2(2) = 16.5$ ,  $p < .0001$ ). Subjects at Kansas State University were more likely to rate their trust (67.4%,  $n = 89$ ) than respond “don’t know” (32.6%,  $n = 43$ ). Subjects at the University of Florida were also more likely to rate their trust (53.5%,  $n = 83$ ) than respond “don’t know” (46.5%,  $n = 72$ ), but to a lesser degree. Subjects at Florida International University, however, were more likely to respond “don’t know” (59.8%,  $n = 55$ ) than to rate their trust (40.2%,  $n = 37$ ).

For cases in which subjects indicated their trust in the message source, analysis of variance (ANOVA) was used to assess the effects of ethnicity, gender, and location on trust. Two-way interactions were the highest-order effects included in the model due to empty and insufficient cell sizes. There were no significant effects at  $\alpha$  of .05.

## Discussion

Regardless of gender, ethnic background, or geographic location, most of the subjects surveyed for this study thought GMO food items should be labeled. It seems, however, that subjects did not simply want labels so they could avoid purchasing GMOs; more than half of the sample indicated they *would* consider purchasing foods labeled as GMOs. Whether or not subjects would consider purchasing GMOs, however, *did* depend on their gender, ethnic background, and geographic location. Consistent with previous research (Hoban, 1998), males were more likely to consider buying GMOs than females. This study also expanded on previous research in its finding while non-Hispanic whites were the ethnic group most likely to consider buying GMOs, more than half of Hispanics would also consider buying GMOs. Most non-Hispanic blacks, however, reported they would not consider buying GMOs. A relatively small sample of blacks was included in this study; therefore, further research is needed to better understand the effect of ethnicity on attitudes toward purchasing GMO labeled food products. Finally, subjects in a relatively rural geographic location were more likely to consider buying GMOs than the control subjects or subjects in an urban location.

Trust in statements concerning agricultural biotechnology was also assessed. The respondents had the most trust in statements that were made by the FDA and USDA, which was consistent with previous research (Gaskett et al., 1999). Trust was lower for statements made by CES, local farmers, or environmental groups. Respondents had the least trust in statements by made by companies that produce GMOs. Interestingly, trust in any of these groups was not affected by gender, ethnicity, or geographic location.

Urban/rural geographic location had a significant effect on whether or not respondents felt they had enough knowledge of the CES to rate their trust in its statements. Subjects at Florida International University, the most urban location, were most likely to reply “don’t know” concerning the CES, while subjects at Kansas State University, the most rural location, were least likely to reply “don’t know.” These results may indicate the challenge ahead for extension in terms of developing biotech public education programs aimed at highly urbanized populations with few ties to traditional extension programming.

## Educational Importance

With so much at stake economically, as well as the potential benefits to be derived from successful application of biotechnology to food and fiber systems, consumer acceptance of biotechnology is a critical issue for stakeholders in all nations. Research, teaching and public education, the essential mission of the land grant university, can be viewed as one potentially effective strategy that can be used to inform diverse audiences about ag biotechnology. This study is important, therefore, from the standpoint that understanding how culture and ethnicity affects consumer acceptance in the U.S. as compared to European nations can be helpful in ascertaining how these factors may play out in other countries with similar heritage and background, where, like the U.S., awareness is still relatively low. Understanding how such factors influence consumer perceptions will also help producers, developers and growers around the world be able to better anticipate the short and long range markets for their products.

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