The Journal of Extension

Volume 44 | Number 1 Article 12

2-1-2006

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Recommended Citation

Ekanem, E., Mafuyai-Ekanem, M., Tegegne, F., & Muhammad, S. (2006). Consumer Trust in Extension as a Source of Biotech Food Information. *The Journal of Extension, 44*(1), Article 12.
https://tigerprints.clemson.edu/joe/vol44/iss1/12

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February 2006 // Volume 44 // Number 1 // Research in Brief // 1RIB2

Consumer Trust in Extension as a Source of Biotech Food Information

Abstract
A mail questionnaire survey was used to collect data on the sources that consumers used for gathering information about biotech food products and nutrition issues. Using responses from 250 randomly selected consumers from three states, this article (1) examines the media and sources from where consumers obtained food products and nutrition information and (2) estimates the level of trust that consumers put on Extension professionals as a source of information. Newspapers, television, magazines, and word-of-mouth were frequently used to gather food products and nutrition information. Extension professionals were ranked as the third most trusted source of information by consumers.

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Introduction

In recent years, the issue of biotechnology in agriculture has generated extensive debate and controversy. This debate will continue as more modified crops and foods enter the food system. One important issue that has confronted professionals in the biotechnology debate is the issue of consumer trust. In the face of massive information coming at them, consumers may not readily be able to determine which source(s) of information to trust. The degree of trust assigned to a source is crucial in the overall decision of the individual.

Biotechnology will continue to have significant impacts on agriculture, rural communities, and

organizations such as Extension (Hoban, 1989; Brown, Kiernan, Smith, and Hughes, 2003). Even in the light of these impacts, controversies surrounding biotechnology (Arends-Kuenning & Makundi, 2000) and how the media is handling coverage of the technology will continue (Eyck & Williment, 2003).

Use of genetically modified crops has been quite pervasive since their introduction. Genetically modified (GM) crops were planted to 145 million acres, worldwide, with U.S. farmers planting more than 66% (96.3 million acres) of all the biotech crops planted globally <http://pewagbiotech.org/resources/factsheets/crops>. In recent years, biotechnology has become a strong part of the American agricultural sector, and, according to the International Food Information Council, IFIC, biotechnology seed usage was expected to reach an "all-time highs in 2003" (IFIC, 2003)

Along with the rapid adoption of the new biotechnology in agriculture is the accompanying belief of American consumers that biotechnology will benefit them and their families within the next 5 years. In an IFIC consumer survey, 43% of survey participants believed that biotechnology will lead to improved quality, taste, and variety of foods. Forty percent believed that nutritional and health value of foods will be improved, while 19% believed that the technology will lead to reduced chemical and pesticide use on plants. While 10% of American consumers believed that biotechnology will lead to reduced food costs, 9% believed that there will be improvements in crops and crop yields (IFIC, 2003).

The role of Extension in the current debate on biotechnology is crucial because Extension " . . . can provide farmers with unbiased information on biotechnology. Agents can provide specialists and researchers with information on farmers' needs, as well as feedback on effectiveness of new technologies" (Hoban, 1989). These new expectations will require training of Extension professionals to ensure that Extension remains competitive in providing needed information to its clientele and stakeholders.

Objectives

The objectives of this article are to: (1) present findings on the media and sources used by consumers to gather information about biotechnology and (2) estimate the level of trust that consumers put in different biotech food and nutrition information sources, including Extension.

Data and Methodology

Data analyzed for this article were collected from a mail survey of consumers in Arkansas, North Carolina, and Tennessee during the summer of 2003. The mail survey instrument was developed with input obtained from focus group meetings in the three states. County Extension agents assisted in organizing the focus group meeting, serving as moderators and/or facilitators.

A preliminary questionnaire was developed and pre-tested using students, university employees, and other willing participants. After the pre-testing, the questions were refined, and a final questionnaire was developed. The finalized questionnaires were used in collecting the information reported in this article. Respondents to the finalized questionnaire were randomly selected from the telephone directories from cities in the counties identified as "high," "medium," "low" income to ensure that the sample was fairly representative of the states' populations. One source for the information used for the county classification was the income data published by the National Association of Counties <http://www.naco.org>.

After randomly selecting the counties and the cities to include in the study, a mailing list was generated from local telephone books. The survey package sent to households contained a cover letter, a coded survey, and a postage-paid, self-addressed envelope. Surveys were mailed to a total of 2,167 randomly selected households, and respondents were instructed that surveys were only to be completed by the household grocery shopper. A total of 250 useable surveys (12% response rate), received in a timely manner, were analyzed.

In order to accomplish this objective, the mean trust scores for each of all other sources of information were compared to the mean trust scores for Extension professionals. All analyses were conducted using the Statistical Package for the Social Science (SPSS, 2003). Findings from the study are used in offering policy implications of the role of Extension professionals in conveying biotech food and nutrition information to consumers.

Results and Discussion

Socio-Economic/Demographic Information

Analysis of data collected showed that 38% of the survey participants were males, while 61% were females. About 78% of survey participants indicated that they had two to four people living in their households, while about 8% indicated that they had five or more. Ten percent of survey participants were less than 34 years old, 53% were between 35 and 54, and about 35% were 55 years or older.

Slightly more than 20% of respondents had high school (including GED) or less education, 22% had

trade or vocational school or some college but no degree, while the remaining 42% had associate or bachelor's degree. About 16% indicated that they had graduate or professional degrees.

Fifty percent of survey participants lived in a rural area outside of town, 10% lived in towns with less than 2,500 people, and 30% lived in towns with 2,500 – 49,999 people.

Based on their 2002 pre-tax (gross) income, only 9% of survey participants earned less than $14,999. About 20% earned between $15,000 and $34,999, while 38% of families in the survey had household incomes between $35,000 and $74,999 (Table 1).

Table 1.
Descriptive Statistics for Variables Used in the Study

Variable	**% of Respondents***
Gender	
Male	38
Female	61
Race	
African-American	14
White	74
American Indian or Alaskan Native	6
Asian	1
Others (some did not indicate group)	5
Age	
Less than 34 years old	10
35 – 54 years old	53
55 and older	35
Education level	
High School/GED or less	20
Trade/vocational school; no degree	22
Associate/Bachelor's degree	42
Graduate or professional degree	16
Place of residence	
Rural area outside of town	50
Town less than 2,500 people	10
Town with 2,500 – 49,999 people	30
City with 50,000 – 99,999	3
City with 100,000 – 499,999	5
City with more than 500,000 people	1
2002 Gross household income	
Less than $14,999	9
$15,000 – $34,999	20
$35,000 - $74,999	38
More than $75,000	32
* Rounded up to nearest whole number; may not add up to 100% due to rounding errors.	

Media Used in Gathering Information and Frequency of Use

Consumers were given seven options (including "other") to indicate how frequently they were used to gather of information on food products and nutrition issues. Respondents were asked to select appropriate responses from a Likert-type rating scale with choices of: 0 = "never used," 1 = "rarely used," 3 = "occasionally used," and 4 = "frequently used." Newspaper was the most frequently used medium, followed by television and word-of-mouth (tied as second most-used) and magazine. The Internet was the lowest in terms of frequency of use. The rankings are presented in Table 2.

Table 2.
Media Used in Gathering Information on Food Products and Nutrition Issues

Media Used for Information	**Use of Medium for Food Products and Nutritional Issues**			
	% of Respondents			
	Never or Rarely	**Occasionally**	**Frequently**	**Ranking****
Magazines	10.2	64.8	25.0	(3)
Newspapers	8.2	55.5	36.3	(1)
Word-of-Mouth	4.1	64.6	31.3	(2)
Television	6.1	62.6	31.3	(2)
Radio	19.6	66.1	14.3	(4)
Internet	32.2	53.6	14.2	(5)

* Based on the total actual number that responded to question, "How often do you use the following media to obtain information about food products and nutritional issues?"

** Based on the "frequently" use response only.

A chi-square test of independence was conducted to examine the level of significant relationship between all selected socio-economic variables and the media used for gathering information. There were significant differences in the use of Newspapers (Π^2 = 12.603, p # 0.05) and Word-of-Mouth (Π^2 = 11.515, p # 0.05) to gather information between males and females. A re-categorization of the variable AGE [0 = less than 44 years, "YOUNG" and 1 = older than 44 years, "OLD"] was used in the analysis.

Age influenced the use of magazines and newspapers in obtaining information about food products and nutrition issues. The level of education influenced the use of word-of-mouth, television, and Internet as media sources of information. The level of significant difference was strong for the Internet (Π^2 = 6.857, p # 0.01). A strong relationship exists between income and the Internet as a medium of information.

Gross 2002 income was very significantly (Π^2 = 15.716, p # 0.01) related to the use of the Internet to gather information (Table 3). Information presented in Table 3 shows that, in general, gender, age, education level, where the consumer lives, and gross household income are important variables that can be used in explaining differences in sources used to gather information on food products and nutrition issues. Understanding how these variables affect consumers' search for information is crucial for delivery of Extension program(s) to consumers.

Table 3.
Chi-Square Values[1] for Media Used and Selected Demographic Variables

Demographic/Socio-Economic Variable	**Media used to obtain information on food products and nutrition issues**					
			Word			

	Magazines	Newspapers	of Mouth	Television	Radio	Internet
Gender [0=male, 1=female]	10.192	12.603**	11.515**	2.772	2.468	0.488
Age [0=less than 44 years, 1=greater than 44]	8.780**	16.934***	1.498	0.549	0.558	0.137
Level of education [0=less than college, 1=college]	6.095	3.109	5.497*	5.157*	1.775	16.857***
Place of residence [0=#50000, 1= >50000]	5.322*	1.822	1.294	1.474	1.144	12.576***
Gross '02 household income [0=less than $50000, 1=greater than $50000]	3.169	2.327	5.040*	1.960	3.172	15.716***

Levels of significance: * p # 0.10; ** p # 0.05; *** p # 0.01

[1] Pearson chi-square statistic calculated as: $\Pi^2 = 3\{(O - E)^2 / E\}$, where O = observed frequency, and E = expected frequency. Chi-square is only a measure of association.

Consumer Biotechnology Information Sources

Respondents to this survey were presented with sources of biotechnology and production information sources and asked to identify the level of trust they put in them. Five Likert-type options were given: "0 = no trust," "1 = low trust," "2 = low trust," "3 = moderate trust," "4 = high trust," and "5 = do not know," and respondents were asked to use the categories in responding.

The frequency of response (Table 4) indicates that the highest percent of response showing the highest trust were Extension professionals (38.4%), closely followed by health officials (37.1%). About 30.9% of all participants indicated that they had high trust for university scientists. The sources with no consumer trust at all were political officials (43.5%), followed television news reporters (23.7%) and radio news reporters (18.7%). These results are consistent with previous studies.

Table 4.
Level of Trust of Selected Sources for Biotechnology Information

	Frequency of Response (%)*			
Biotech Information Source	**No Trust**	**Low to Moderate Trust**	**High Trust**	**Do Not Know**
Farm Journalists	5.3	60.0	19.2	15.5
Biotech Industry Scientists	9.8	63.3	14.7	12.2
Food Industry Professionals	8.5	65.2	19.4	6.9

University Scientists	**3.7**	**58.1**	**30.9**	**7.3**
Extension Professionals	**3.7**	**50.0**	**38.4**	**7.9**
Government Scientists	13.2	63.8	16.5	6.6
TV News Reporters	23.7	65.3	6.9	4.1
Family and Friends	3.6	59.1	30.8	6.5
Radio News Reporters	18.7	65.4	7.7	8.1
Producer Groups	11.7	70.9	10.9	6.5
Consumer Groups	8.2	65.6	22.1	4.1
Environmental Groups	17.7	61.7	15.2	5.3
Political Officials	43.5	48.4	2.0	6.1
Health Professionals	**6.1**	**53.9**	**37.1**	**2.9**
Regulatory Agency	15.5	63.3	13.9	7.3
Grocers	15.5	69.4	8.2	6.9

* Trust Recoding Used: 0 = no trust; 1 = low to moderate trust; 2 = high trust; 3 = do not know]

Table 5.
Mean Values for Trust of Selected Sources of Information About Biotechnology

Information sources	**n (number of responses to the trust question)**	**Mean Response***
Farm Journalists	207	1.95
Biotech Industry Scientists	215	1.71
Food Industry Professionals	230	1.81
University Scientists	**228**	**2.10**
Extension Professionals	**223**	**2.20**
Government Scientists	227	1.65

TV News Reporters	235	1.19
Family and Friends	231	2.06
Radio News Reporters	226	1.25
Producer Groups	231	1.51
Consumer Groups	234	1.82
Environmental Groups	230	1.51
Political Officials	231	0.74
Health Professionals	**238**	**2.13**
Regulatory Agency officials	227	1.55
Grocers	228	1.39

* Value based on: 0 = "no trust", 1 = "low trust", 2 = "moderate trust", 3 = "high trust".

n is the actual number of households that responded to the specific question. Low mean response values indicate low trust levels while high values indicate high trust levels.

Comparing Extension Professionals with Others as Information Source

Because one interest of the article is to compare the trust rating of Extension professionals to others, t tests were used for accomplishing the task. The null hypotheses tested, in all cases, was that the differences in the mean value of trust for extension professionals and the mean value of trust for other sources of information was equal to 0. The alternative was that the difference was not equal to 0. Specifically, these could be written as:
H_0: $\mu_{\text{mean trust in extension}} - \mu_{\text{mean trust in other source}} = 0$; H_1: $\mu_{\text{mean trust in extension}} - \mu_{\text{mean trust in other source}} \neq 0$,

where H_0 and H_1 are the null and alternative hypotheses, respectively and μ denotes the mean.

This formulation represents a two-tailed hypothesis test where there is no a priori assignment of the direction of the relationship. The specific formula for computing the t statistic used in testing the null hypothesis is given by: t = [(Mean Difference)/ (Standard Deviation /sqrt (n))]. Results of the pair-wise tests showed that the other sources of information used in acquiring biotechnology information were significantly different from extension professionals as a source. All results were significant at the 5% level. Results are displayed in Table 6.

Table 6.
T-test Results for Differences in Trust Ratings among Alternative Sources

Information Source	**Mean Difference**	**Standard Deviation**	**95% Confidence Interval of the Difference**		**T statistic**
			Lower	**Upper**	

Farm Journalists	0.25	0.80	0.14	0.37	4.496**
Biotech Industry Scientists	0.52	0.86	0.40	0.64	8.615**
Food Industry Professionals	0.41	0.84	0.29	0.52	7.049**
University Scientists	0.13	0.83	0.02	0.24	2.463*
Government Scientists	0.53	0.83	0.42	0.65	9.447**
TV News Reporters	1.00	1.08	0.85	1.14	13.549**
Family and Friends	0.17	1.10	0.03	0.32	2.228*
Radio News Reporters	0.90	1.03	0.76	1.04	12.596**
Producer Groups	0.69	0.94	0.57	0.82	10.874**
Consumer Groups	0.40	1.09	0.25	0.55	5.403**
Environmental Groups	0.70	1.16	0.54	0.86	8.836**
Political Officials	1.45	1.03	1.31	1.59	20.530**
Regulatory Agency officials	0.64	1.06	0.50	0.78	8.873**
Grocers	0.81	0.99	0.68	0.94	11.932**

[1] All pair-wise comparisons of differences in trust ratings were between selected information sources trust mean value and Extension Professional trust mean value of 2.20.

* 5% level of significance; ** 1% level of significance

Conclusion

This article has shown that consumers gather food products and nutrition information through various media. Four commonly used media were: newspapers, television, word-of-mouth, and magazines. Chi square analysis showed that media used to gather information about farm products and nutrition issues were related to gender, age, level of education, place of residence, and gross household income. These findings are consistent with previous research that suggests that the young and wealthy tend to use the Internet more than do the old and the poor.

The top three sources from which consumers gathered information about biotechnology were: Extension professionals, health professionals, and university scientists. These sources were also the most trusted sources for the consumers that participated in the survey.

Implications for Extension

Biotechnology in agriculture has only recently been the subject of intense debate among scientists, the public, and policy makers. This article has demonstrated that opinions and attitudes towards biotechnology and trust in the sources of biotech information depend, to a great extent, on demographic, socio-economic, and other characteristics of the consumer. These characteristics are very important and could affect how Extension delivers its programs to them.

Because consumers are seeking Extension professionals as a source of information, there should be a conscious effort to invest in training/education for sharpening the skills of these professionals. This kind of training and education will update current skills and knowledge in the area of biotechnology to further enhance consumer confidence in extension professionals. Such an investment will benefit not only the extension system, but also the clientele and stakeholders it serves.

Acknowledgements

The authors thank the editor and three anonymous reviewers for helpful comments. We extend our appreciation to campus project directors Dr. Eric Wailes (University of Arkansas, Fayetteville), Dr. Dennis Balogu (University of Arkansas, Pine Bluff), and their research staff for assistance in collecting data for the project. Financial assistance from the United States Department of Agriculture under project #2001-52100-11212 and the Institute of Agricultural and Environmental Research, Tennessee State University, are also gratefully acknowledged. The views expressed in this article are those of the authors and not necessarily those of the USDA or collaborating universities.

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