Changing Consumer Perceptions about Genetically Modified Foods

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Market channel participants must:

- Evaluate benefits, costs, and risk associated with use of biotechnology and its products.

- Determine labeling and promotion strategies for resultant food products.

Consumers have new choices.

Little is known about the willingness of consumers to purchase GM food products.

- ⇨ Consumers are not well informed.
- ⇨ Market research is limited.

Objective is to develop hypotheses regarding potential market segments and discuss issues associated with reaching them

METHODS

How do we assess consumer behavior?

1. Observe them (revealed preference)
2. Ask them

Revealed preference was observed through an experimental auction.

Participant characteristics, knowledge, attitudes and behaviors were self-reported (we asked them)

Experimental Auction

Auction items include individual serving, convenience-sized products (chocolate chip cookies and blueberry muffins) and bags of potato chips.

Voluntary labeling scenario tested.

POTATO CHIPS

NUTRITION FACTS

Serving Size: 1 ounce (28 g), approximately 17 chips

		Percent of daily value
Calories	150	
Total Fat	9 grams	14
Cholesterol	0 mg	0
Sodium	160 mg	7
Total Carbohydrate	15 grams	5
Protein	2 grams	

Ingredients: Selected potatoes, corn, sunflower, and/or canola oil and salt

** This product does not contain genetically modified ingredients.

The Experimental Auction

- Pre-auction survey
- Practice rounds
- First round of bidding
- Participants asked to read information about the impact of biotechnology on the environment
- Second round of bidding
- Post auction survey

Genetically Modified Crop News Update

Fewer, less toxic pesticides used by farmers who grow genetically modified crops

▲ The USDA's Economic Research Service has determined that overall, genetically modified crops have reduced farmers use of pesticides nationwide.

▲ Estimates indicate a 1.9 to 3 percent reduction of pesticide acre-treatments from 1997 to 1998 when genetically modified crops are grown instead of traditional crops.

▲ The use of genetically modified Bt crops reduces insecticide use overall. Bt corn has led to a 2 - 3 percent reduction in the use of insecticides to control the European corn borer.

▲ There has been a decrease in total pounds of herbicides applied to soybeans when they are produced with genetically modified seed.

▲ Genetically modified crop production uses glyphosate is used instead of other, more toxic herbicides. Glyphosate can be 3 to 6 times less toxic than the herbicides it replaces; also 1.6 to 1.9 times less likely to persist in the environment.

Yield gains

▲ The genetically modified crops Bt corn and Bt cotton are associated with significantly higher yields in "most years for some regions" according to the USDA ERS, 1999.

Soil and Water Conservation

▲ Genitically modified crops are associated with soil conservation because farmers don't need to till the soil to control weeds.

▲ The production of genetically modified crops generates land and natural environment conservation due to more efficient crop production on current farm land. Less land needs to be plowed under for crop production.

▲ Some genetically modified crops can be engineered to tolerate drought, reducing the use of ground and surface waters for irrigation.

▲ Genetically modified crops that are herbicide resistant require less plowing, thus reducing wind erosion and water sediment damages.

Potential

▲ Less air and energy emissions are produced from genetically modified crops due to efficient transport of less perishable products.

Sources: Henry A. Wallace Center, 2000 and Batie and Ervin, 1999

Genetically Modified Crop News Update

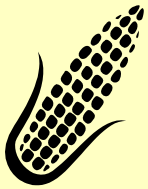
Increases use of certain herbicides

▲ Planting transgenic crops that are resistant to specific herbicides may actually increase the use of these herbicides.

▲ 13.4 million pounds of glyphosate have been substituted on GM soybeans for 9.9 million pounds of other synthetic herbicides. The Economic Resource Service says that genetically modified soybeans have led to an increase in the use of the herbicide glyphosate.

Lower yields

▲ Genetically engineered soybeans that are herbicide-resistant actually have a lower yield than traditional varieties.



Increased tolerance in certain insects

▲ Insects can rapidly adapt to environmental pressures. This means insects could become resistant to genetically modified crops that are insect resistant, thus leading to use of chemicals with higher toxicity.

▲ Huang et al. (1999) - - The inheritance of resistance to Bt toxin by the European corn borer is incompletely dominant. Thus the corn borer may become resistant to genetically modified Bt crops more quickly.

Genes could move to wild species, creating weeds

▲ The scientific community has little doubt that genes from genetically modified crops will move into the wild.

▲ These genes could thrive in the wild and increase the "weediness" of some wild plants by giving them a fitness advantage.

▲ Herbicide-resistant crops could potentially interbreed with wild, weedy relatives -- leading the weedy relatives to become resistant to herbicides. Farmers would then have to increase the amount or toxicity of herbicides used in farming these genetically modified crops.

Harming non-targeted species

▲ Genetically modified crops that are pest-resistant may contain toxins that hurt non-target species such as insect predators, soil biota, birds, and invertebrates.

▲ Monarch butterfly larvae that feed on milkweed leaves dusted with pollen from the genetically engineered Bt corn have a higher mortality rate than those who feed on leaves with non-Bt pollen.

Sources: Henry A. Wallace Center, 2000 and Batie and Bryan, 1999 and Huang et al, 1999.

Identification and Influence of Market Segments

- Identify potential market segments including investigation of relationships in participant perceptions

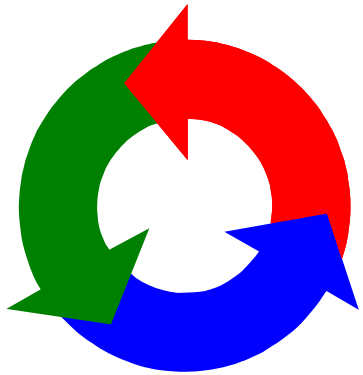
- Consider effect of auction process and information bias on perceptions, knowledge and attitudes of participants.

- Identification of information sources considered by respondents

RESULTS, Respondent Profiles -- Demographics

- Majors concentrated in the social sciences
- Evenly split by gender
- Most Caucasian, single, and childless
- 72% employed
- 83% Lutheran or Catholic
- 30% raised on farm.
- Majority from a town of less than 10,000 inhabitants

Respondent Profiles -- Beliefs and Attitudes



Overall some evidence of respondent environmental concern

- 60% reported using recycled products always or frequently
- 45% recycling always or frequently but 30% never recycling
- Agriculture majors recycled / used recycled products the least.

- Over two-thirds agreed more action needs to be taken to preserve the environment.
- 29% agreed man has upset nature's balance
- 17% agreed pesticides are poisonous and should be prohibited

Respondent Profiles -- Beliefs and Attitudes

Participants not well informed about GM foods.

Extremely well informed — Not informed at all

1 ——— 8

Average = 5.73

- Two-thirds considered themselves somewhat informed or not informed at all.
- 11% well informed or extremely well informed.

Participants believed there were substitutes for GM food products.

- Three-quarters thought substitutes available always or frequently
- Only five percent believed there were never substitutes

Respondent Profiles -- Beliefs and Attitudes

High risk — No risk

1 — 8

Average = 5.32

Most perceived only a moderate (38.4%) or low (46.4%) level of risk or no risk (5.4%) associated with consuming GM foods.

- Participants majoring in agriculture, computer science and natural resource management perceived a low level of risk.
- Business majors assigned a relatively high level of risk, consistent with a very low level of self-reported knowledge of GM foods
- Perceiving a higher level of risk were those with children, females, and those who did not grow up on a farm, and those who grew up in large metropolitan areas

Respondent Profiles -- Beliefs and Attitudes

Uniform distribution depicted participant reading of labels

- Women reported reading labels more often than men.

In general literature suggests an option value associated with labeling (i.e., more consumers desire labels than would read or base decisions on them)

Market Segmentation

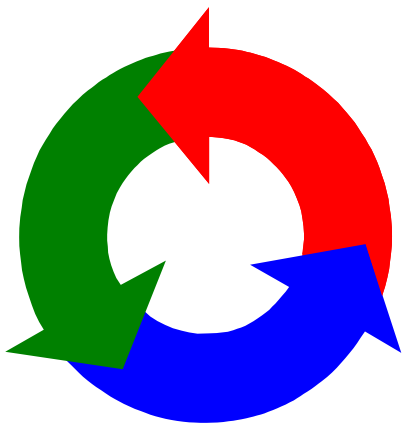
Agriculture and natural resources management majors, those raised on a farm, and males consider themselves more well informed and do not perceive there to be as great a risk associated with consuming GM foods.

They less strongly agree that there are environmental issues, specifically that pesticides are carcinogenic and poisonous and should be prohibited (farm raised) and that more action is necessary to preserve the natural environment (agriculture majors and males).

These groups likely less receptive to information and persuasion.

A Closer Look at Respondent Perceptions

Perceived level of risk associated with GM foods positively correlated with perception action to protect environment warranted, especially that pesticides are carcinogenic and should be prohibited.



Frequency of recycling behavior was not (strongly) correlated with opinions regarding necessary action to protect the environment, except among farm-raised participants.

Correlations among perceptions about man's effect on the environment and the necessity for action not particularly strong

- Man has upset nature's balance
- More action should be taken to preserve natural environment
- Pesticides are carcinogenic and should be prohibited

Influence of Auction Process and Information Bias

Average percentage food perceived as GM decreased slightly

- Decrease among control was 3%
- Increase among those receiving positive-biased information

Those receiving GM information regardless of bias thereafter perceived themselves as more informed.

Risk associated with GM food consumption as expected under biased information.

Influence of Auction Process and Information Bias

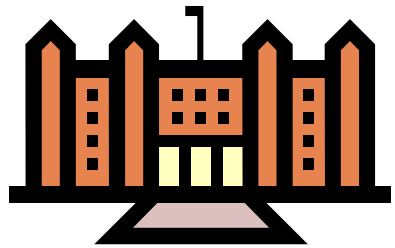
No consistent trend in effect regarding respondents' beliefs about man's influence on environment and necessary action

- Level of agreement that pesticides are carcinogenic and should be prohibited increased, especially for those receiving GM information.

So? Consider implications for consumer perceptions about other agricultural practices.

Information Sources?

Who do you consider a reliable source of information regarding biotechnology?



•Government agency (43%)

➔ noted by only 32% of farm-raised participants

➔ Is government is a trusted source for information (protector of the environment? food supply?)

• Scientist (25.6%), University Scientist (11.6%)

➔ noted by 52% of farm-raised participants

Credibility of information source may be important in presenting information about the science of agriculture.

Conclusions

Objective was to develop hypotheses!

Population / methods naturally limit (applicability of) results

- Population Homogeneity
- Self-reported data
- Methods

Conclusion 1 -- Consumer perceptions can be influenced

What are the effects of exposing consumers to (non) GM labels at retail (e.g., on willingness-to-pay, their perceptions of the prevalence of GM foods?).

Of providing information or exposing consumers to promotional materials?

Do the effects, e.g., prevalence of GM foods at retail, influence consumer perception of their acceptability? willingness-to-pay? How? Why?

Conclusion 2 -- Providing information makes consumers believe they are more informed.

An expected, but slightly unsettling result.

Questions for consideration

- Are specific segments of consumers more responsive to information? information offered via different vehicles and highlighting different messages?
- How does prior knowledge of the consumer influence the effect of information?
- Do consumers in general and those in specific market segments recognize biased information? (How) does it change the effect of the information on their perceptions or actions?

Conclusion 3 --Informational or promotional campaigns can have unintended effects

Special attention must be paid to minimize unintended, undesired effects of promotional strategies.

Example -- will advertising a branded product as non-GM change consumers' perceptions about other products marketed under the same brand? by the same firm?

Conclusion 4 -- The extent to which consumers will go to purchase or avoid purchasing certain food products cannot be assumed

Perceived risk was not in general correlated with how often participants read labels on food products.

Presumably perceived risk does not result from or contribute to consumers attempting to learn more about the food they are purchasing (e.g., by reading labels).

Conclusion 5 -- Surveys need to be carefully planned

Instruments must be designed so questions are understood as intended and responses reveal the expected information about the respondent.

Beta testing instruments is of particular importance.

Thank You

Are there any questions?