GM Labeling and the Implications for Consumers'Willingness to Buy in the Brazilian Market

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ABSTRACT

This research analyzed Brazilians' willingness to buy GM labeled margarine.We aimed to measureconsumers' willingness to purchaseGM labeled margarine and its relationship with brands, trust of consumers in institutions and interestin this type of product. Results showed that consumers' willingness to buy GM labeled margarinetend to be lower than their willingness to buy Non-GM labeled products.The power of a strong brand apparently is not enough to neutralize potential negative effects of GM labeled margarine in willingness to buy. Consumers with high trust in institutions as biotechnology companies, researchers and producers show a higher level of willingness to buy GM labelled products.

KEY-WORDS: Genetically modified foods; GM labeling; willingness to buy

1. INTRODUCTION

The introduction of genetically modified (GM) content in food products has been the object of highly controversial debates in several countries for over a decade. GM content is a credence attribute that cannot be identified by consumers through taste or appearance, so without labeling consumers will not have enough information to express their true preferences for this attribute in their purchasing behavior (Dannenberg et al., 2011).

In 2005, formal and stable legislation authorizing the growing of genetically modified soybeans in Brazil started with the approval of the new Biosecurity Law. At this time, this new type of soybeanwas plantedin the crop year between 2005 and 2006, being harvested in the first semester of 2006. From that period, genetically modified soybeans and their derived products were available in the Brazilian market.

In 2008, Brazil retained its position as the country with the third largest hectarage of biotech crops in the world, estimated at 15.8 million hectares. In 2012, Brazil ranks second only to the USA in biotech crop hectarage in the world, with 36.6 million hectares, and emerging as a global leader in biotech crops. For the fourth consecutive year, Brazil was the engine of global growth in 2012, increasing its hectarage of biotech crops more than any other country in the world – a record of 6.3 million hectare increase, equivalent to an impressive year-over-year increase of 21% (Clive, 2012).

In a project discussed since 2003, the Brazilian Ministry of Justice has defined a specific labeling identification to be utilized on products containing more than 1% of genetically modified ingredients.This symbol should be used on the package of foods and food ingredients aimed to human or animal consumption.

Figure 1.GMF Identification Symbol in Brazil.

However, despite the approval of the law, companies took some time to adopt it and GMlabeling in Brazil almost failed. The implementation crisis was generated by pressure of food companies, which feared the

reactions of consumers, and by the lack of an appropriate governmental structure and resources to control and check the transgenic ingredients used in food (Folha de São Paulo, 2005).

As a result of pressure from advocacy groups of consumers and due to the initiative of the government of a few States, the attitude of Federal government towards GM labeling became more severe, forcing food companies to label GM correctly. Even so, in the period of 2007, only a few products were suited to GM labeling. Due to this changing environment,it was relevant to better understand theimpact of GM labeling on consumer buying behavior in Brazilian market and its influence on buying intentions, product acceptance,brand selection, price sensitivity and confidence level on institutions involved in this issue at the time of 2007.

2. OBJECTIVES

This study aims to understand consumers' willingness to buy GM labeled foods and its relationship with brands, consumer's demographics, knowledge and trust in several institutions.

The specific objectivesare described as follows: i) to understand how different brands affect consumer's willingness to buy GM labeled and non-labeled products; ii) to verify how consumer's demographics affects willingness to buy GM labeled and non-labeled products; iii) to understand how the level of knowledge and involvement of consumers impact on willingness to buy GM labeled products and non-labeled products; iv) to understand how trust in institutions as companies, government, farm producers, consumer advocacy groups and environmental preservation organizations affect willingness to buy GM labeled products.

3. PREVIOUS RESEARCH AND BACKGROUND

Many markets for novel food products are characterized by a lack of information. To counter a lack of information, governmental and non-governmental entities often want to provide consumers with information but do not know exactly what information would be most valuable (Rousu and Lusk, 2009).

Consumers normally value non-GM food higher than GM food. They only value the presence of GM ingredients when it comes along with certain benefits, for example, increased shelf life or better taste. Second, the willingness-to-pay (WTP) varies geographically. Third, the WTP varies with product and type of genetic modification. Attitudinal variables, such as concerns for health and environment, generally seem to be more important for the valuation of GM food than socioeconomic variables, such as gender or age (Dannenberg et al., 2011).

Several studies showed that the concerns of consumers about GM goods and their acceptance may vary among different countries as shown by the meta-analysis of Dannenberg et al. (2009) and Lusk et al. (2005).

Lusk et al. (2005) conducted a meta-analysis of 25 primarystudies that report a total of 57 valuations for GM food. Theseprimary studies involve several stated-preference methods as wellas experimental auctions.Across all studies, consumers on average placed anywhere from a 42% (unweighted average using all data) to a 23% (weighted average excluding one outlier) higher value for non-GM food relative to GM food. Findings also indicate as much as 89% of the variation in existing value estimates for GM food can be explained by an econometric model that controls for the characteristics of the sample of consumers studied, the method for eliciting consumers' valuation, and characteristics of the food being valued. Each of these factors has a statistically significant effect on estimated premiums for non-GM food (Lusk et al.,2005).

Dannenberg (2009) presents a meta-analysis of 51 primary studies reporting a total of 114 genetically modified food valuation estimates. Results indicate that elicitation methods and formats used in the primary studies affect valuation estimates much more than do sample characteristics. The analysis of average preferences and dispersion of preferences indicates clear differences between regions. Besides, region-specific preferences diverge over time.

Hu et al.(2009) analyzed information access decisions using an endogenous perspective to the product choice decision-making process. A major contribution is the analysis of individual's simultaneous access to information and product choices, enabled by an internet-based survey design that involved voluntary access to different types of information. They find evidence of interdependence between decisions of information access and product choice.

Dannenberg et al.(2011) used a laboratory experiment to investigate consumers' acceptance of GM food in Germany. Based on elicited consumers' WTP for GM and non-GM soybean oil and chocolate bars, respondents who took part in the experiment demonstrably favor non-GM over GM food and require an average price discount of 47–59% to buy GM food. Yet, not all subjects prefer non-GM food. Six to twelve percent of participants are indifferent between GM and non-GM products and 8% prefer the GM version to the non-GM version.

Sleenhoff and Osseweijer (2013) analyzed consumers purchasing behavior of GM food products and compared this with their attitude and behavioral intention for buying GM food.Results show that despite a majority of consumers voicing a negative attitude toward GM food, over 50% of European respondents stated that they did not actively avoid the purchase of GM food and 6% actually purchased one of the few available GM labeled food products in the period between September 2006 and October 2007.The authors state that a voiced negative of consumers in answers to surveys regarding their intentions is not a solid guide for what they actually do in supermarkets.

Colson and Rousu (2013) explored a number of unresolved issues related to questions that are critical when considering the sum of the individual contributions that constitute the evidence on consumer preferences for GM foods.

However, despite the existence of various studies on GM food acceptance worldwide, none of them has focused on Brazilian market. Thus, this paper might be relevant in order to fill this gap in literature about Brazilians' willingness to buy GM labeled foods.

4. METHODS AND DATA

The research was performed in 2007 andcollected data from an Internet-based survey that was sent to students, teachers and professionals of personal contact base of the authors. Due to the lack of information about the number of Internet users at the time, we chose the nonprobability sampling method. Although thesampling process was not representative, itpermitted us to reach a raw sample of 1.983 respondents.Sorting mechanisms were also included to eliminate possible duplications and frauds. By checking and refining the data, we obtained 1.634 effective answers.

In order to measure the willingness to buyGM labeledfoods, we tested margarine product (a type of butter made of vegetal oils). Two Brazilian margarine brands were tested–**Doriana**– a leader brand, and the other one – **Vigor**– a brand not as famous as the previous one.

We considered Doriana a stronger brand due to its higher price positioning at the year of 2007, which was almost US$ 1.00for a package of 200 grams. The Vigorbrand was in a lower price positioning which was US$ 0.70for a package of 200 grams, according to the Agricultural Economic Institute (IEA, 2007). It was expected thatboth brands could attenuate the negative willingness to buyGM labeled food, commonly cited by other studies.

In the first part of the survey, each participant was randomly exposed to one of the 4 images of margarines: 1)GM labeled with leader brand, 2) Non-GM labeled with leader brand, 3) GM labeled with regular brand and 4) Non-GM labeledwith regular brand.

Figure 2. The 4 images of margarines randomly exposed to respondents.

1 - GM labeled with leader brand   2 -Non-GM labeled with leader brand

3 - GM Labeled with regular brand   4 - Non GM labeled with regular brand

After the randomized display of margarine images, participants answered questions regarding their buying profile, buying intentions, knowledge and interest about GM products and biotechnology, trust in institutions, regulatory mechanisms, knowledge about transgenics, ethical worries and socioeconomic information. We aimed to evaluate the relationship between those variables and the willingness to buy GM labeled products. Table 1 shows a synthesized view of variables used in the survey instrument. To a more detailed view, the complete survey can be found in the Appendix 1.

Table 1. Group of Variables

Groups of Variables	Variables
Buying Profile	1 to 4
Buying Intentions	5 to 9
Knowledge and interest about GM products and biotechnology	10 to 25
Trustin Institutions	26 to 31
Socioeconomic Information	32 to 38

The following hypotheses were formulated to reach the research objectives:

- Hypothesis #1 - Consumers' willingness to buy GM labeled products of a leader brand is higher than GM labeled products of a regular brand.
- Hypothesis #2 - The willingness to buy GM labeled products of consumers who have a high level of trust in institutions is higher than those who havea lower level.
- Hypothesis #3 - The willingness to buy GM labeled products of consumers with high level of interest in GM and biotechnology is higher than those who have a lower level.

The investigation of the relationship of the variableswas made using clusteranalysis and multinomial logistic regression techniques. The first step was to use factor analysis to reduce the questions of willingness tofew factors. These factors were used to answer the willingness to buy of the respondents and cluster the sample to use the multinomial logistic regression. For this method the software STATA® 12.0 was used. The multinomial logistic model can be described by the function as following:

$$WTB = f(BRD, TrC, TrG, TrR, TrAG, TrP, TrEO, AGE, GN, EDUC, INC, \varepsilon)$$

Where *WTB* is the willingness to buy, *BRD* is brand, *TrC* is the trust in companies, *TrG* is the trust in government, *TrR* is the trust in researchers, *TrAG* is the trust in advocacy groups, *TrP* is the trust in producers, *TrEO* is the trust in environmental organizations, *AGE* is the age, *GN* is the gender, *EDUC* is the educational background and INC is the income and ε is a random error.

The factors found have a high Cronbach's Alpha, which enabled a good approximation of the willingness to buy of consumers. After the factor calculation, we used the k-means method for clusters and the groups were separated by those who saw the GM identification symbol and those who did not. This division was necessary to highlight the difference of the impact generatedby the variables towards willingness to buy.

Proceeding with the tests we conducted the multinomial logistic test and the results had statistical significance. The differentiationbetween the groups ofconsumers who saw the GM labeled identification symbol or notbecame possible through the postestimation that calculated the marginal effects for the variables.

5. RESULTS

The variables used in the survey were reduced by factor analysis using the principal component analysis with Varimax rotation. This led to a group of significant factors (eigenvalues greater than one were considered) jointly explaining 87.07% of the variance.The Table 2 shows the values of factor loading:

Table 2. Factor Loadings of Willingness to Buy

Questions	Factor: Willingness to buy
buying option	**0,926**
buying intention	**0,949**
product recommendation	**0,923**
Eigenvalue	2,619
Cronbach'sAlpha	0,925

Total N = 1634

The factor is composed by the variables buying option, buying intention and product recommendation, described by the questions 7, 8 and 9 of the survey. The Cronbach's Alpha was used to verify the robustness

and internal reliability was high for the factor.The value of 0.925 is acceptable, guaranteeing that variables with high factor loadings in the analysis are highly correlated with the factors.

The second step wasto conduct a cluster analysis with the factor from the component analysisestablished based on F Statistics and R-square values (Punj and Stewart, 1983). Table 3 summarizes the clusters means for consumers' willingness to buy margarine. The clusters were divided into two groups according to the experiment.One group contains the respondents who were exposed to GM labeled and the other contains the respondents who saw the regular labeling.Particularly, this methodof analysisenabled us to evidence the impact of the difference between the GM labelingand the standard labeling in willingness to buy margarine.

Table 3. Clusters means for consumer's willingness to buy margarine

Clusters	Low WTB(n=761)	High WTB (n=873)
Exposed to GM labeled margarine (n=889)	1,80	4,03
Exposed to Non-GM labeledmargarine (n=745)	1,86	4,05

Total N = 1634

Table 4 brings the relationship of each observable characteristic in variables like brand, trust in institutions and socioeconomics information. These variables impact in consumers' willingness to buy of both groups: those who were exposed GM labeled margarine and those who were not. The impact is observed through the marginal effects. Apositive value in the characteristic observed would make a customer belong to a certain cluster. Results suggest that there are influences of GMlabeling in consumers' willingness to buy margarine.

Table 4. Marginal effects in consumers' willingness to buy

	Exposed to GM Labeled Margarine		Exposed to Non-GM Labeled Margarine	
	Coefficient	Standard Deviation	Coefficient	Standard Deviation
Brand	-.036407	.0304289	.1395657***	.034144
Trust in Companies	.09666***	.0169458	-.0160324	.0206534
Trust in Government	.0063482	.0147866	.022909	.016992
Trust in Researchers	.1053241***	.0190679	.0552623**	.0227134
Trust in Advocacy Groups	-.0359659*	.0191176	-.0156419	.0202854
Trust in Producers	.0539022***	.0182622	.0098756	.0212759
Trust in Environmental Organizations	-.0503182***	.0175316	-.0057611	.0187817
Age	-.0442619***	.0170228	-.0649118***	.0185544
Gender	.1053209***	.0305843	.0854724***	.0356026
Education Background	-.0456748**	.0188456	-.0575872	.0214315
Income	-.0042697	.0139732	.014213	.0157675

Note: *, **, *** significance level at .10, .5 and .01 respectively

Total N = 1634

5.1 Consumers' willingness to buy GMlabeled margarine and its relation with brands

Results show that there are relations between consumers' willingness to buy GM labeled margarine and different brands. When Non-GM labeled margarine is exposed to consumers, the leader brand influence is stronger than when GM labelled margarine is exposed and the marginal effect is positive at a significance level of 0.01, as shown on Table 4. However, the brand influence tends to reduce when GM labelled margarine is showed and consumers may consider the leader brand and the regular brand as more or less the same, which rejects the Hypothesis #1: Consumers' willingness to buy GM labeled products of a leader brand is **not** higher than GM labeled products of a regular brand. This situation could affect the brands influence and may impact in how food companies communicate GMlabeled products and its potential attributes.

5.2 Consumers' willingness to buy GM labeled margarine and its relation with consumer's trust in institutions

There are relations between willingness to buy GMlabeled margarine and trust in different types of institutions. Trust in severalinstitutionswere analyzed and its relation with willingness to buy GM labeled margarine is described hereafter.

Consumers who trust more in companies have higher willingness to buy GM labeled margarine than those who trust less. However, trust in companies apparently does not affect willingness to buy when the Non-GM labeled product is exposed to consumers.

Consumers who trust more in researchers have higher acceptance of GM margarine, independently if the product shown was GM labeled or Non-GM labeled, despite this trend is stronger in consumers exposed to GM labeled margarine.

Consumers who trust more in environmental organizations have lower willingness to buy when exposed to the GM labeled margarine. However, this trend is not relevant when consumers are not exposed to the GM margarine.

Consumers who trust more in producers tend to have greater willingness to buywhen exposed to GM labeled margarine then those who were not. However, trust in producers is not influent when Non-GM labeledmargarine image is exposed to consumers.

Apparently, there is no significant influence of consumers' trust in government institutions in willingness to buy. This trend was verified between the two groups of consumers, those exposed to GM labeled margarine and those exposed to Non-GM labeled margarine.

Results regarding trust in companies, researchers and producers confirm Hypothesis #2: The willingness to buy GM labeled products of consumers who have a high level of trust in institutions is higher than those who have a lower level. Trust in environmental organizations has negative influence in willingness to buy GM labeled margarine.

5.3 Consumers' willingness to buy GM labeledmargarine and its relation with consumer's demographics

There are relations between willingness to buy GM labeledmargarine and consumers' demographics. There is a negative marginal effect as age increases: older consumers have less willingness to buy the transgenic margarine than younger consumers. This difference is emphasized when GM labeled margarine is exposed to consumers.

Regarding gender, men have more willingness to buy GM margarinethan women and this influence is stronger when GM labeled margarine is exposed.

Regarding education background, consumers with higher education background have less willingness to buy when GM labeled margarineis exposed. However, this trend is not relevant when consumers are exposed to the Non-GM labeled margarine.

We did not find significant influence of income in willingness to buy GM margarine in the sample. This trend was verified in the GMF and Non-GMF exposed consumers groups.

5.4 Consumers' Willingness to Buy GM labeled margarine and its relation with knowledge and interest about GM and Biotechnology

Based on literature, a few questions were proposed in two sections to evaluate the knowledge Brazilians have about GM foods. At the first section, the level of perception, interest, perceived and declared knowledge were measured. At the second section, a quiz to measure the real knowledge about transgenic and biotechnology was applied.

The results showed that an expressive portion of the sample, equivalent to 93.1%, already knew something about transgenics. When they were asked about how much they had listened, read or watched about GM foods, 35.8% marked the category "sufficient", followed by the category "average" with 24.7%. Only 21.1% stated to have heard, read or watched "a little" or "nothing" about transgenic.
The questions results that dealt with the frequency which the participants have discussed about transgenic foods are also important because they can be used as a measurement instrument of involvement and interest of the respondents for the theme. In the literature concerning attitudes and intentions it is noticeable that the level of involvement is an important factor that influences behavior. About this, the categories with the highest number of answers were "rarely", representing 37.6%, followed by 33.5% of the category "sometimes". Participants that showed a high involvement (interest) by the theme added 17.7% (13.3% represented by the category "frequently" and 4.4% by the category "always").

The general belief that there are foods containing transgenic ingredients for sale at the supermarkets was marked by the majority (91.3%) of the respondents. The participants that "don't know" represent 7.5%, while 1.2% believes that there are no transgenic food products being sold at supermarkets.

The majority of participants believe that they have already eaten foods that contain transgenic ingredients (82.6%), while 3.6% declare that they do not believe so. Those who did not know how to answer represented 13.8%.

The level of self-knowledge declared (perceived) by the participants was reasonable, totaling 60.7% of the participants classified from the category "average" (27.8%), "sufficient" (28.3%) and "a lot" (4,6%). Respondents of the category "a little" or "nothing" represented, respectively, 36% and 3.3%.

The results of the second section (evaluation of the true knowledge – quiz test) indicate that the knowledge of the respondents can be considered medium to good, as shown on Table 5. Seven of ten questions had more than 60% of correct answers.

Table 5. Quiz Answers Percentage by Question

Questions	Correct Answer	Incorrect Answer	Don't know or are no sure
16 – Regular tomatoes do not contain genes, while transgenic tomatoes (genetically modified) contain.	78.30%	5%	16.60%
17 – If a person eats a transgenic fruit (genetically modified) this person's genes can also be modified.	82.90%	1.8%	15.40%
18 – The mother's genes determine the child gender.	77.70%	10.90%	11.40%
19 – Transgenic animals (genetically modified) are always bigger than the normal animals.	73.70%	4.20%	22.10%
20 – It is not possible to transfer animal genes to plants.	44.80%	16%	39.30%
21 – Transgenic tomatoes (genetically modified) with fish genes would probably taste like fish.	61.10%	3.40%	35.50%
22 – The cloning of living creatures produces genetically identical copies.	77.40%	8.90%	13.70%
23 – Over half of the human genes are identical to the monkeys.	59.40%	7.40%	33.10%
24 – Researchers frequently modify plants so that they won't be able to reproduce.	37.90%	28.10%	34.10%
25 – Larger organisms have more genes.	72.40%	3.10%	24.60%

Regarding the international comparison of the results of this quiz about biotechnology, the respondents show to be in a better situation than the USA and European Union respondents. Brazilian respondents presented higher levels of correct answers than the USA and EU respondents in 9 of 10 questions. Besides this result, the data must be exanimated with caution due to sample limitations.

Table 6. Percentage comparison of correct answers among participants of Brazil, USA and EU

Percentage of respondents with correct answer	Brazil n = 1634	USA n = 600	EU n = 16.500
16 – Regular tomatoes do not contain genes, while transgenic tomatoes (genetically modified) contain.	78.3%	40%	36%
17 – If a person eats a transgenic fruit (genetically modified) this person's genes can also be modified.	82.9%	45%	49%
18 – The mother's genes determine the child gender.	77.7%	57%	53%
19 – Transgenic animals (genetically modified) are always bigger than the normal animals.	73.7%	36%	38%
20 – It is not possible to transfer animal genes to plants.	44.8%	30%	26%
21 – Transgenic tomatoes (genetically modified) with fish genes would probably taste like fish.	61.1%	42%	***
22 – The cloning of living creatures produces genetically identical copies.	77.4%	54%	66%
23 – Over half of the human genes are identical to the monkeys.	59.4%	40%	52%
24 – Researchers frequently modify plants so that they won't be able to reproduce.	37.9%	44%	***
25 – Larger organisms have more genes.	72.4%	38%	***

*** questions not researched.

Source of USA and EU results: Curtis et al. 2004 and Gaskell et al. 2002.

These results suggest that Hypothesis #3 is valid: the willingness to buy GM labeled products of consumers with high level of interest in GM and biotechnology is higher than those who have a lower level.

6. CONCLUSIONS

There is significant relation between willingness to buy a brand and GMlabeled margarine. Results showed that the GM labeling has adverse effects on the power of brands. Companies can be strongly affected by GMF labeling and this may impact on how they will develop their messages and communicate their value offer to the customers.

There are relations between willingness to buy GM margarine and trust in different types of institutions.When this dimension was analyzed, findings demonstrated that consumers who have higher trust in food and biotechnology companies, researchers and producers,tend to have greater tendency to accept and buy transgenic products.

Consumers who trust more in environmental preservation organizations and consumers' advocacy groups have lower willingness to buy transgenic products. These organizations have strongernegative influence in consumers' willingness to buy. However, no significant difference in willingness to buy transgenic food was found when compared to consumers with high trust in the government.

Regarding demographic aspects, results showed that age and educational background have negative influence on willingness to buy transgenic products. Older consumers have less willingness to buy, as well as those who studied more. Male consumers, in general, have more willingness to buy than female consumers. However, family income showed no influence. These results may help companies targeting

segments, reducing the negative effects of transgenic labeling and creatingdifferentiated value offers to consumers.

While verifying the knowledge level of Brazilians represented by the sample, it is possible to state that the majority have an average to high level of knowledge about the theme.

The main findings allow us to conclude that transgenic labeling in Brazil clearly influences the willingness to buy GMF products. It also may impact in other aspects ofconsumers'buying behavior. As transgenic labeling advances in Brazil, this process creates challenges to the whole agribusiness production chain and embraces producers, grain elevators, farm and food processing industries, distributors, certification agencies and consumers.

New researches regarding the theme in emerging markets could address the willingness to pay, the impact of labeling different transgenic products (industrialized and non-industrialized, animal and vegetal, etc.), nutritional benefits provided by new developed foods and certification. We suggest that this study should be replicated in the present scenario, after greater insertion of GM labeled products in Brazilian market. Futures studies might helpcompanies to better understand thesechanges and have direct impact on these companies' strategies.

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APENDDIX 1.Survey

Survey on food and Biotechnology
Part 1 – Buying profile
1 – How often are you responsible for your household food purchasing?   1 - never 2 - rarely 3 - sometimes 4 - often 5 – always
2 - How often do you buy "organic" food (free from chemicals)?   1 - never 2 - rarely 3 - sometimes 4 - often 5 – always
3 – How often do you buy "light/diet" foods (low calories or less sugar)?   1 - never 2 - rarely 3 - sometimes 4 - often 5 – always
4 – How often do you read nutritional information on the labels of the food you buy?   1 - never 2 - rarely 3 - sometimes 4 - often 5 – always
Part 2 – Buying intentions
Look carefully at this product:
Random exhibition of the margarine image to each respondent
5 – According to what you have been shown, the product is: 1 - transgenic (genetically modified) 2 – non-transgenic (not genetically modified)
6 – According to what you have been shown, the product brand is: 1 - Doriana 2 – Vigor
7 – I consider the product above as one of my purchase choices.   1 – totally disagree 2 - disagree 3 – neither agree nor disagree 4 - agree 5 – absolutely agree
8 – I would buy the product above.   1 – totally disagree 2 - disagree 3 - neither agree nor disagree4 - agree 5 – absolutely agree
9 – I would recommend the product above to my family and friends.   1 – totally disagree 2 - disagree 3 – neither agree nor disagree 4 - agree 5 – absolutely agree
Part 3 – Knowledge and interest about transgenic and biotechnology
The remainder of the survey will deal with **genetic modification or transgenic**, which can be used for food production. **Genetic modification or Transgenic** involves methods that enable scientists to create varieties of plants and animals. They do so by removing genes from a plant or animal and putting them into other plant or animal cells. This process is also called genetic engineering or biotechnology.
10 – Before this survey did you already know what Transgenic (genetic modification) was all about?   1 - yes 2 – no
11 – How much did you hear/read or watch something about transgenic (genetically modified) foods?   1 – not at all 2 – very little 3 – neither much nor little 4 - enough 5 – quite a lot
12 – How often have you talked to someone about transgenic (genetically modified) foods?   1 - never 2 - rarely 3 - sometimes 4 - often 5 - always
13 – Do you believe that transgenic (genetically modified) foods are already available for sales at supermarkets?   1 - Yes 2 - No 3 – I don't know
14 – Do you believe you have already eaten food containing transgenic (genetically modified) ingredients?   1 - Yes 2 - No 3 – I don't know

15 – How much do you believe to know about transgenic (genetically modified) organisms? 1 – not at all 2 – very little3 – neither much nor little 4 - enough 5 – quite a lot
16 - Common tomatoes contain genes while transgenic (genetically modified) tomatoes don't 1 - True 2 – False 3 – I don't know
17 - On eating transgenic (genetically modified) fruit, a person's genes can also be modified. 1 - True 2 – False 3 – I don't know
18 – A mother's genes determine her baby's sex. 1 - True 2 – False 3 – I don't know
19 - Transgenic (genetically modified) animals are always bigger than ordinary animals 1 - True 2 – False 3 – I don't know
20 – It's not possible to transfer animal genes to plants. 1 - True 2 – False 3 – I don't know
21 – Transgenic (genetically modified) tomatoes with fish genes will probably taste like fish. 1 - True 2 – False 3 – I don't know
22 – The cloning of people produces genetically identical copies. 1 - True 2 – False 3 – I don't know
23 – More than half human genes are identical to apes genes. 1 - True 2 – False 3 – I don't know
24 – Researchers usually modify plants so that they cannot reproduce. 1 - True 2 – False 3 – I don't know
25 – Larger organisms have the most genes. 1 - True 2 – False 3 – I don't know
Part 4– Trust
26 – Biotechnology (transgenic organism producers) companies are concerned about consumers' health. 1 – totally disagree 2 - disagree 3 – neither agree nor disagree 4 - disagree 5 - absolutely agree
27 – The government is able to regulate, control and inspect both the quality and safety of transgenic (genetically modified) foods. 1 – totally disagree 2 - disagree 3 – neither agree nor disagree 4 - disagree 5 - absolutely agree
28 – Scientists behave ethically and morally while conducting research on transgenic (genetically modified) foods. 1 – totally disagree 2 - disagree 3 – neither agree nor disagree 4 - disagree 5 - absolutely agree
29 – I always trust consumer advocacy groups (such as, PROCON, IDEC, etc.) 1 – totally disagree 2 - disagree 3 – neither agree nor disagree 4 - disagree 5 - absolutely agree
30 – Growers are aware of the benefits and risks of producing transgenic (genetically modified) foods. 1 – totally disagree 2 - disagree 3 – neither agree nor disagree 4 - disagree 5 - absolutely agree
31 – I always trust environmental conservation organizations (such as Greenpeace, WWF, etc.) 1 – totally disagree 2 - disagree 3 – neither agree nor disagree 4 - disagree 5 - absolutely agree
Part 5 – Socioeconomic information
32 - Age under 16; 16 – 20; 21 -30; 31 – 40; 41 – 50; over 50
33 - Sex male; female

34 – Education background unfinished elementary (primary) school; finished elementary (primary) school; unfinished high (secondary); school finished high (secondary) school; unfinished tertiary education finished; tertiary education master/doctor degree holder	
35 – Family Income ;Up to R$ 350; R$ 350 to R$ 1.000; R$ 1.000 to R$ 2.500; R$ 2.500 to R$ 5.000; R$ 5.000 to R$ 7.500; over R$ 7.500	
36 – How many members contribute to family income? 1; 2; 3; 4; 5; 6 or more	
37 – How many members of the family are supported by this income? 1; 2; 3; 4; 5; 6 or more	
38 – Marital Status single; married; divorced; others	

APENDDIX 2. Multinomial Logistic Regression for Groups of Willingness to Buy

Variable	Exposed to GMF Margarine		Exposed to Non-GMF Margarine	
	Coefficient	Standard Deviation	Coefficient	Standard Deviation
Brand	-.1777953	.1490566	.6140136***	.1563911
Trust in Companies	.4720443***	.0880176	-.0705341	.0910003
Trust in Government	.031002	.0722378	.1007871	.0750886
Trust in Researchers	.5143557***	.0985354	.2431244**	.1013907
Trust in Advocacy Groups	-.1756415	.0940051	-.068816	.0893769
Trust in Producers	.2632344***	.0906554	.0434475	.0936516
Trust in Environmental Orgs.	-.2457314***	.0869957	-.0253456	.0826493
Age	-.2161553***	.0842246	-.2855768***	.0841037
Gender	.5143401***	.1529318	.3760322**	.1588815
Education Background	-.2230555**	.0931117	-.2533526***	.0958925
Income	-.0208511	.0682521	.0625293	.0695059
Constraint	2.229476***	.5244519	2.075101***	.5617503
Obs.	889		745	
LR Chi2(11)	174.73***		58.61***	
Pseudo R2	0.1418		0.0574	
Log likelihood	-5.286.813		-48.101.396	