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Georgian Consumer Attitudes Towards Genetically Modified Products

Abstract

Genetically modified products (GM) have been sensitive topic in different societies. This paper looks at (GM) from one consumer group's perspective; specifically, from the Ajara region of Georgia in February 2014. A survey of 603 consumers revealed that these respondents knew very little about genetic engineering but held a negative attitude towards GM products, expected the government to regulate both their import and production, and wanted GM to be identified as such. Even if priced lower than comparable foodstuffs, most consumers would not buy them. An empirical investigation based on analysis of variance and Pearson's correlation coefficient demonstrated that education, income and social class were significant determinants of genetic engineering awareness among consumers, while age had no impact.

Keywords: genetically modified products, consumer behavior, empirical research, Georgia, Ajara
JEL: C12, M31, R22

Introduction

Each year world population increases, complicating the ability to adequately feed a growing number of people. Genetic engineering and genetically modified organisms purport to offer a partial solution to this problem.

However, the role of GMO has proven to be controversial. In one camp are those that see only benefits, arguing that genetic engineering enhances our ability to deal with climatic change and population growth. The focus of the other camp is the inherent, unpredictable (and possibly irreversible) dangers posed by interfering in evolutionary processes.

The growing availability of GM products suggests that many consumers are willing to accept them. Yet relatively few people know much about their features. The aim of our research is to study consumer attitudes towards genetically modified products in the Autonomous Republic of Ajara, and use those findings to formulate relevant recommendations.

Genetically Modified Food in Georgia

Each year, genetically modified products are produced in greater volumes; accordingly, their share as a percentage of food consumed has increased in many countries. Georgia, which depends on imported goods, is one such country. According to official 2013 statistics [National Statistics Service of Georgia, 2013], 73% (7 885 billion USD) of the country's foreign trade turnover (10 793 billion USD) were imports and 27% (2 908 billion USD) were exports. The major exporters to Georgia are Turkey (21%) and China (9%), and the majority of imports (about in 80%) are from the largest companies in these two countries, which as a rule target markets in developing countries and apply genetically modified substances in their manufacturing processes.

GMO Regulations in Georgia

The main objective of regulating GMO is to find and enforce an appropriate balance between potential benefits and potential risks to human health. Effective bio-safety regulations require a coordinated international approach. For this purpose, the Cartagena Protocol on Biosafety was enacted on September 11, 2003, to which more than 80 countries are parties. Georgia ratified this protocol in the autumn of 2010. On December 11, 2014, the law on "labelling the genetically modified organisms designed for feeding animals or as food and the genetically modified product produced from them", was adopted and became effective on July 1st, 2015.

This law regulates the market locations of genetically modified products and establishes legal requirements concerning their import. Its objective is to provide Georgian customers with sufficient labelling (and other) information about genetically modified products to protect them and enable easier choice. Also, it aims to establish a degree of government control in this area and make Georgian legislation conform to the legal norms established by other international acts and relevant EU legislation.

Literature Review

Academic research on consumer attitudes towards GM products in various countries has not been conclusive.

Buhr, Hayes, Shogren and Kliebenstein's [1993] study on customer attitudes towards genetically modified products indicated that respondents were interested in them because they were 30–60% less caloric, and promoted weight loss.

Boccaletti and Moro [2000] surveyed 394 respondents in Northern Italy on their knowledge of, and feelings towards, genetic engineering. The results suggested that demand for genetically modified products was impacted by income levels and available information. More information accessed by consumers yielded more positive views about GM products, for which they were willing to pay more than for similar, traditional products grown with fertilizers and other chemicals.

By contrast, there was a very negative attitude towards genetically modified products in Japan. McCluskey, Grimsrud, Ouchi and Wahl's [2003] survey of 400 customers found that 80% had an unfavorable attitude and would not purchase genetically modified products even at a 50% discount. These researchers noted that Japanese customers needed guarantees that the products they bought were not detrimental to human health.

One of the first studies on customer attitudes towards genetically modified products in developing countries was undertaken in Brazil [Gonzalez, Johnson, Qaim, 2009]. That research was aimed at identifying the knowledge and opinions of North Brazilian customers about genetically modified cassava, which was richer in A group vitamins than its unmodified counterpart. The majority of respondents were ready to pay 60–70% more for the genetically modified cassava in comparison to the natural product.

In 2013, Turkish researchers [Turker, Kacak, Aydin, Istanbulluoglu, Yildiran, Turk, Kilic, 2013] studied the knowledge, behavior and attitude of students at the Gulhane Military Medical Academy (GMMA) towards genetically modified products. Three hundred forty-six females were surveyed, of whom 82.9% believed that most Turks are not fully informed about genetically modified products and 77.7% stated that genetic engineering carries high risks for all live organisms. Some 85.5% of respondents believed that products they use may include genetically modified additives, 89.6% wanted those additives to be labeled and 72.8% considered their consumption to be very dangerous.

China, which is the fourth largest country producing genetically modified corn, was the object of a study undertaken in Beijing [Li, Curtis, McCluskey,Wahl, 2002]. The results showed that the majority of the 599 respondents lacked information on this subject. Nevertheless, young customers were relatively more positive towards genetic engineering than older respondents. It bears mention here that the main source of public information in China are TV channels controlled by the state, which are positively oriented towards new technologies. Moreover, the Chinese government supports the development and financing of new technologies.

The objective of all the above-mentioned studies was to verify consumer knowledge, behavior and attitudes towards genetic engineering. In combination, they indicated that people know little about genetically modified products, and most therefore prefer to avoid buying them. In all of the studied countries, consumers wanted the government to regulate the development of genetic engineering, and control and limit the production and consumption of genetically modified organisms to protect the population from risks.

Research on general consumer behavior in Georgia was undertaken in the 2000 s, at the Marketing Department of Ivane Javakhishvili, Tbilisi State University [Apil, Kaynak, Todua, 2008]. This study found that the decision-making process related to purchasing is impacted by the country from which the product originated.

Bio-safety issues were studied by specialists and jurisprudence experts under the UNEP/GEF project [Development of National System of Bio-Safety in Georgia, 2005]. This project researched the population's attitude towards genetically modified organisms and food products, showing that respondents believed the use of genetically modified organisms damages the environment and negatively impacts human and animal health.

Most respondents suggested that the government should regulate imports and the production of genetically modified organisms and food products, and also examine products directed to shops. Generally, consumers expressed a negative attitude towards GMO products.

No other studies on this subject have since been undertaken in Georgia. Our detailed study on GMO product knowledge and consumer buying habits was designed to take place in the Autonomous Republic of Ajara. Ajara is located in the south-western part of Georgia across the Black Sea coastline. According to official data [State Department of Statistics, 2014], in 2014 Ajara was populated by 336,077 people. Ajara is an agrarian subtropical region. Besides agriculture, important industries include oil, engineering, and tourism. Ajara, was chosen because it is able to grow high quality agricultural products, and serves as an important gateway (particularly the port at Batumi) to other parts of the country and the whole Caucasus region. The Sarpi custom checkpoint (also located in Ajara) connects Georgia with Turkey, and is the main point through which the mainstream import-export activities are conducted. In addition, Adjara is the major center of Georgia's coastal tourism industry. Thus the Ajara food market is of particular importance for the region and development of its tourism potential.

Research Methodology and Data

We divided the research into two stages. The main purpose of the first stage was to develop a sample of buyers who purchased genetically modified products for further, in-depth study. We wanted the sample to be representative of the Georgian population. To meet this requirement we applied stratified selection, which involves division of the whole population into a number of homogenous layers (strata), and then sampling a given number of units from each stratum, proportionately to its size [Malhotra, 1999]. By using stratified sampling we made sure that various groups of population would be represented in the sample in the right proportion.

For determining the sample size we used the following formula [Belyaevsky, Kulagina, Korotkov, 1995]:

$$n = \frac{t^2 \text{ x } \delta^2 \text{ x } N}{t^2 \text{ x } \delta^2 + \Delta^2 \text{ x } N}$$

Where:
n – sample size
t – value of the t-statistic for a given confidence level (here, 95%) and an infinite number of degrees of freedom
δ^2 – variance of the control variable in the population (here, consumption of GMO products),
Δ – precision level, or the maximum permissible amount of random error
N – population size

The variance of the control variable in a population of interest could be estimated from previous research studies, however no reliable past data exist on the fraction of the Georgian population who consume GMO products. Hence, it is necessary to assume the highest possible variation which would exist if there were an equal split between consumers (50%) and non-consumers (50%) of GMO [Golubkov, 1998].

Following typical precision levels used in similar marketing studies [Iadov, 1995] we set our margin of error to 4%.

The major group of consumers of genetically modified products in Georgia is 20 to 65 years of age. According to the State Statistics Department of Georgia, this represents 232,829 people (110,709 men and 122,120 women). Based on the above assumptions our minimum net sample size was given by:

$$N = \frac{1{,}96^2 \text{ x } 2500 \text{ x } 232829}{1{,}96^2 \text{ x } 2500 + 4^2 \text{ x } 232829} = 599$$

The research was conducted in Georgia in February, 2014. Six hundred and three consumers from 25 villages and 3 cities of Ajara (316 men and 287 women) were surveyed. The face-to face method of gathering data was implemented.

TABLE 1. Sample structure according to age and occupation

AGE	MEN								TOTAL	WOMEN							TOTAL
	Worker	Soldier	Specialist	Entrepreneur	Unemployed	Student	Supervisor	Pensioner		Worker	Specialist	Entrepreneur	unemployed	Student	Supervisor	Pensioner	Housewife	
20–24	2	_	5	2	1	37	2	0	49	_	3	2	5	34	1	_	4	49
25–34	8	2	11	4	14	_	3	_	42	1	29	1	5	1	9	_	13	59
35–54	34	2	21	10	40	_	13	_	120	8	44	5	22	_	6	_	35	120
55 >	32	_	22	3	34	_	4	10	105	5	17	_	12	_	1	18	6	59
TOTAL	76	4	59	19	89	37	22	10	316	14	93	8	44	35	17	18	58	287

S o u r c e : own elaboration.

To achieve the research objective, the questionnaire was designed to identify:
- customer consciousness towards genetically modified products;
- customer attitude towards genetically modified products;
- customer opinions on genetic engineering;
- differences in consumers' knowledge on genetically modified products according to their socio-demographic characteristics.

Determining Customer Consciousness Towards Genetically Modified Products

The results of our study showed that the majority of surveyed respondents did not have a basic familiarity with genetically modified production. Fifty-three percent were unable to name the positive characteristics of genetically modified products and refrained from answering the question concerning them. Twenty-seven percent declared that the positive features of genetically modified organisms include their durability and resistance to diseases. Thirteen percent thought that genetically modified products exhibited improved quality. The opinion that genetically modified products were healthy was supported by only 3% of respondents, and 4% of them considered them as promoting biodiversity. The majority of respondents declared that the usage of genetically modified organisms damaged the environment and negatively impacted human health. Twenty-five percent of respondents believed that genetically modified organisms may cause severe diseases, as opposed to 3% who felt they could only damage bio-diversity and were not harmful to humans. Only 5% emphasized that the systematic use of genetically modified products in manufacturing processes may contamínate ground waters, but risked no other damage, and 24% thought that consuming genetically modified products jeopardized human life,

biodiversity, and groundwater contamination. On the other hand, 43% of respondents did not know what negative impacts may be caused by the consumption of genetically modified products and refrained from answering the question, 13% thought that genetically modified products had never been offered on the Georgian market, and 31% considered the Georgian market of genetically modified products to be saturated. As many as 56% of the surveyed customers had no idea about the Georgian consumer market.

Ajdara consumers therefore exhibited very limited market consciousness, particularly concerning the characteristics of GMO products. All told, 89% of respondents lacked complete and reliable information about genetically modified food products and did not know the benefits or risks of using them. At the same time, the majority of consumers feared such products and tried to avoid buying them.

Ajara Customer Attitudes towards Genetically Modified Products

Professor Paata Koghuashvili, who is a Member of the Georgia Academy of Agriculture [2010], claims that Georgia did not need to produce genetically modified goods as its agriculture had a potential of feeding 10–12 billion people. Our research revealed that 57% of surveyed respondents thought that Georgia did not need to produce genetically modified products because it had enough resources to offer traditional ones, while 15% of respondents suggested that Georgia, like many other countries, should manufacture genetically modified products. 28% of the sample was undecided on the subject. It should be noted that 60% of respondents said they read product labels before purchasing, 78% expected information on modified additives to appear on product lables, and 10% did not see the need for such information. The remainder of the sample (12%) did not trust any information from suppliers on GMO additives. These results were in line with our expectations. In the next study stage we sought connections between customerattitudes and product prices. Accordingly, we asked survey respondents whether they would purchase genetically modified products that were cheaper than traditional products. More than 67% would not do so, and 6% stated a peference for the cheaper product. The remainder (27%) stated that their decision would depend on their actual economic situation.

Opinions of Ajara Consumers on Genetic Engineering

Our research showed that 28% of respondents considered that reliable confirmation of the impact of genetic engineering on the environment or on human health was lacking. 6% of respondents believed reliable information was available. The majority of respondents (66%) declined to answer the question due to a perceived lack of information. According

to 81% of respondents, the government should regulate the importation and production of genetically modified food products through legislation, and inspect these products to protect the public. For the largest respondent group (84%), the most important factor impacting purchasing behavior was product quality. The question is how respondents understood this category. Only 5% of the sample concentrated on visual aspects (product design), and 11% on product price.

Factors Influencing Genetic Engineering Awareness among Consumers

Based on previous studies and our observations we defined several hypotheses that consider the degree of awareness and purchasing behavior of Georgian customers.
H1: *Education influences awareness about genetic engineering.*
H2: *Age influences awareness about genetic engineering.*
H3: *Income influences awareness and at the same time buying and consumption of GMO;*
H4: *Social class influences consumers' awareness about genetic engineering* .

The data were processed using the SPSS (Statistical Package for the Social Sciences) statistic program. We employed analysis of variance and the Pearson correlation coefficient. A Two Way ANOVA F-Test was employed to verify the hypotheses. First, we established that education significantly affected information spreading and awareness of consumers with regards to genetic engineering and GMO products ($F=4.478$, $p<0.004$). These findings suggest that H1 was supported, hence the more educated a person, the more GMO information s/he possessed.

TABLE 2. Impact of education level on genetic engineering awareness

Estimated Marginal Mean						
Dependent Variable: *Awareness*						
	Sum of Squares	df	Mean Square	F	p	Partial Eta Squared
Model	10.491	3	3.497	4.478	.004	.022
Error	458.453	587	.781			

P<0.05 means that the differences between the groups studied are statistically significant.
Source: own elaboration.

We then investigated whether age differences impacted consumer awareness about GM products and determined that it did not ($F=1.850$, $p<0.137$). Therefore H2 was not confirmed.

TABLE 3. Impact of age on genetic engineering awareness

Estimated Marginal Means						
DependentVariable: *Awareness*						
	Sum of Squares	df	Mean Square	F	p	Partial Eta Squared
Model	4.334	3	1.445	1.850	.137	.009
Error	458.453	587	.781			

P<0.05 means that the differences between the groups studied are statistically significant.

Source: own elaboration.

In addition, we examined whether there was any inter-dependence between age, education and awareness, using the Two Way ANOVA F-Test to establish that the combination of education and age did not impact the genetic engineering awareness of consumers.

TABLE 4. Impact of age and education level on genetic engineering awareness

Tests of Between-Subjects Effects						
DependentVariable:Informed						
Source	Type III Sum of Squares	df	Mean Square	F	p	Partial Eta Squared
Corrected Model	25.816	15	1.721	2.204	.005	.053
Intercept	363.654	1	363.654	465.620	.000	.442
Education	10.491	3	3.497	4.478	.004	.022
Age	4.334	3	1.445	1.850	.137	.009
Education – Age	5.552	9	.617	.790	.626	.012
Error	458,453	587	.781			
Total	2230,000	603				
Corrected Total	484,269	602				

P<0.05 means that the differences between the groups studied are statistically significant.

Source: own elaboration.

To check the robustness of our conclusions about Hypothesis 1 regarding education level impact on GMO awareness we used the Pearson correlation coefficient. The resulting findings allow us to say with 99% confidence that the level of education is a significant determinant of awareness.

We applied ANOVA and the Pearson Correlation Coefficient to test hypothesis H3. Because 149 respondents refused to provide their income levels, only the data of 454 respondents (out of 603) were used.

TABLE 5. Education level and genetic engineering awareness based on the Pearson correlation coefficient

Pearson Correlation Coefficient			
		Awareness	*Education*
Awareness	Pearson Correlation	1	-.184**
	Sig. (2-tailed)		.000
	N	603	603
Education	Pearson Correlation	-.184**	1
	Sig. (2-tailed)	.000	
	N	603	603

P<0.05 means that the differences between the groups studied are statistically significant.
Source: own elaboration.

The ANOVA showed that income very weekly but significantly impacted the decision-making process with regards to genetically modified products.

TABLE 6. Impact of income on the decision- making process to consume GMO products. Dispersion analysis

Univariate Analysis of Variance Tests of Between-Subjects Effects						
Dependent Variable: *Decision to buy GM product*						
Source	Type III Sum of Squares	df	Mean Square	F	p	Partial Eta Squared
Corrected Model	4.508a	4	1.127	3.227	.013	.028
Intercept	412,824	1	412.824	1182.095	.000	.725
Income	4,508	4	1.127	3.227	.013	.028
Error	156,804	449	.349			
Total	1030,000	454				
CorrectedTotal	161,313	453				

P<0.05 means that the differences between the groups studied are statistically significant.
Source: own elaboration.

On the other hand, when assessed with Pearson's correlation coefficient (Table 7), the data show a weak negative correlation of income with purchasing attitudes of genetically modified products (R= –0.030). However, this association is not statistically significant (P=0.518), and it cannot be assumed that income is a significant factor in the GMO products consumption. To conclude, the outcomes do not provide reliable evidence in favor of H3, and hence it should be rejected.

TABLE 7. Impact of incomes on decision- making according to the Pearson correlation coefficient

Correlations			
		Income	*Decision to buy GM product*
Income	Pearson Correlation	1	-.030
	Sig. (2-tailed)		.518
	N	454	454
Decision to buy GM product	Pearson Correlation	-.030	1
	Sig. (2-tailed)	.518	
	N	454	454

P<0.05 means that the differences between the groups studied are statistically significant.
Source: own elaboration.

To analyze hypothesis H4, the One Way ANOVA test was used. It shows that respondents' social class significantly impacts their interest in and awareness of genetic engineering (F=5,003, p<0.000).

TABLE 8. Impact of social class of consumers on genetic engineering awareness

OneWay ANOVA					
Dependent Variable: *Attention*					
	Sum of Squares	df	Mean Square	F	p
Between Groups	27.160	8	3.395	5.003	.000
Within Groups	403.052	594	.679		
Total	430.212	602			

P<0.05 means that the differences between the groups studied are statistically significant.
Source: own elaboration.

Conclusions and Suggestions

Our research results can be concluded as follows:

- Ajara consumers know little about genetically modified products;
- A negative attitude, fear and caution towards GM products are consequences of this lack of knowledge;
- Ajara consumers expect the government to regulate imports and the production of genetically modified organisms;

- Currently, consumers are unable to distinguish genetically modified products from natural ones, and require reliable information on food products introduced to the market to be able to do so.

  There are several characteristics influencing consumers' genetic engineering awareness.
- Education level significantly influences awareness.
- Income is an important awareness determinant but does not drive behavior (lack of statistically significant relationship between income and the level of consumption of GM products).
- Social class significantly influences awareness.
- Consumer age does not impact awareness.

These results permit the following recommendations. The lack of clear scientific evidence about risks related to the genetically modified products increases the importance of GM product regulation in the Georgian market. In particular, until risks are negated scientifically, the Georgian Government should control and limit GM product production and consumption.

The current low level of information and awareness among Georgian respondents suggests need to take steps to better educate the public. Greater awareness of possible damagers posed by GM products will limit demand for GMO foods. This awareness could be facilitated through mass media, but the mainstream media will never talk openly about these issues. Better ways to educate the population are therefore needed. For example, anti-GMO organizations and healthy food producers should more actively communicate the findings of their research by organizing various forums, seminars, open doors, etc. Especially in schools and higher educational institutions, Doors Open Days should be organized more frequently to better inform the young generation about the potential promise and potential pitfalls of GM products.

Notes

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