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# Investigating Shopper Awareness and Attitudes Towards Genetically Modified Foods in Trinidad, West Indies

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## *Abstract*

*The development of genetically modified foods (GMFs) has led to consumer concern about food safety and environmental protection. The objective of this study was to determine the Trinidadian shopper awareness and attitudes toward GMFs. One hundred and twenty six (126) respondents were interviewed by a structured questionnaire of 19 questions with sections on demographics, awareness, willingness to purchase GMFs perceived benefits and risks, labeling, availability of GMFs and responsibility for GMFs information Whilst some respondents (44.4%) have not heard of GMFs, the slight majority of 54.8% of all respondents claimed to have some knowledge of the topic. Furthermore it was found that of the respondents who claimed to know of GMFs were 55.6% had an incorrect understanding of the term. Respondents were asked if they believed that GMFs were well publicized in Trinidad with 42.9% 'strongly disagreeing', 39.7% 'disagreeing', 13.5% 'agreeing', and 3.2% 'strongly agreeing', this was further emphasized by the finding that the majority of respondents(67.5%) were not mindful of any GM food product on the market. It was the view of the majority that GMFs should not be sold in Trinidad, with risks to human health (71.4%) and the environment being major concerns. GMFs were viewed in a positive light with reference to food security, although the majority of respondents (88.1%) stated they would purchase non-GMFs as opposed to GMFs, if priced equally. Significant relationships (P<0.05) were determined between awareness of GMFs, education and employment, as well as overall attitude to GMFs genuine awareness and publicity. There was no significant statistical relationship between age and overall attitude to GMFs.*

*Keywords: risks, environment, health, labeling, education*

## Introduction

In recent years, the topic of food security has a risen to the forefront of global issues, with many Governmental and Non-Governmental organizations hosting various meetings to develop strategies to combat this prevalent issue. Of all the discussions one of the tentative solutions has been that of Genetically Modified Organisms (GMO'S). Given the mandate by the United Nations in 2011, which stipulated that by 2050, a 70% increase in food production would be required, GMFs have been highlighted as a possible solution. (ISAAA 2011). .A genetically modified organism is defined as an organism whose genome has been engineered in the laboratory in order to favor the expression of desired physiological traits or the production of desired biological products. GMO's allow the agricultural industry to have crops which can withstand severe conditions, and still yield a substantial amount of high quality produce. (Diaz and Fridovich-Keil 2012).

Currently, there are numerous GMO

manufacturers worldwide, such as Monsanto (US Based) producing GMFs such as rice, soy, cotton, and maize. As of 2011, 160 million hectares are utilized worldwide for cultivating genetically modified food. This represents a 94-fold increase from 1.7 million hectares in 1996 to 160 million hectares in 2011 makes biotech crops the fastest adopted crop technology in the history of modern agriculture. Furthermore as of 2011, twenty-nine (29) countries were growing GM crops. In 2011, a record 16.7 million farmers, up 1.3 million or 8% from 2010, grew biotech crops – notably, over 90%, or 15 million, were small resource-poor farmers in developing countries .Table 1 highlights the top ten GM producing countries by area and type of crop produced. (ISAAA 2011) Seventeen mega-countries (USA, Brazil, Argentina, India, Canada, China, Paraguay, Pakistan, South Africa, Uruguay, Bolivia, Australia, Philippines, Myanmar, Burkina Faso, Mexico, Spain) grow more than 50, 000 hectares or more of biotechnology crops.

There is no doubt as to the benefits that GMO's can provide increased food production, reduced use of pesticides and herbicides and food security are just a few of the benefits of GMO's. However, there are concerns being aired about GMO's as well, the foremost of which being the impact on the environment and human health. With food security becoming an increasingly predominant global issue, consumers' awareness and attitudes toward the use of GMO's in food production is rather significant. Policies regarding genetically modified foods will have to be drafted according to the acceptance or rejection of GMO's by the public.

In most countries, the levels of awareness and acceptance of GMFs have been shaped by divergent messages from environmentalists and biotech industries (Ho et al. 2006). According to Arvanitoyannis and Krystallis (2005), any attempt to introduce GMFs into the market must be supported by the analysis of consumer evaluation procedures for GM products. Also, these authors have identified six categories of factors which relate to consumers' attitudes

and beliefs, which influence the overall consumer behaviour vis-à-vis GMFs: (1) awareness, pre-existing beliefs towards food technology and its risks and other general attitudes, (2) perceived GM consumption benefit, (3) socio-demographic profile, (4) social and moral consciousness, (5) perceived food quality and trust, and (6) other secondary influential factors. This classification assumes a conflict between the beliefs of 'risks' and 'benefits'. Hence the objectives of this study were to determine shopper awareness and attitudes toward genetically modified foods (GMFs) in Trinidad.

## Methodology

Structured questionnaires comprising of 19 questions were administered in the month of October 2012. The sections of the questionnaire were based on demographics, awareness, willingness to purchase GMFs perceived benefits and risks, labeling, availability of GMFs and responsibility for information on GMFS. A pretest was done at the University of the West Indies, involving, ten willing respondents who lived on halls of the campus and five security guards. Once this was completed, modifications were made to phrasing and sequencing of questions.

Members of the research team then visited ten supermarkets, at various locations in North, Central, and South Trinidad. One hundred and twenty six (126) participants/shoppers were systematically selected from ten supermarkets which were located in the North, Central and Southern parts of Trinidad. A questionnaire was administered in the presence of an interviewer. Furthermore, demographic data was collected inclusive of sex, age, and educational level.

The data was then compiled and analyzed with the SPSS 16.0 for Microsoft Windows 7. The Chi- square test was applied to test the relationship between, employment and awareness, education and awareness of GMFs sold in Trinidad. Additionally ANOVA was used to test relationships of, awareness

of GMFs and overall attitude toward GMFs and, publicity and overall attitudes toward GMFs with all tests conducted at α 0.05 level of significance.

## Results and Discussion

### Awareness

When the respondents were asked whether they knew what a genetically modified food (GMF) was only 54.8% responded 'yes'. Of those who answered 'yes ' to having to known what a GM food was were asked to state their understanding of the term 'GM food'. Fig.1 shows that of the respondents, 55.6% had an incorrect understanding of the term, whilst 44.4% had a genuine understanding of the term GMFs. The shoppers associated GMFs with the incorporation of new genes (18.3%), with added chemicals (13.6%), are modified (9.6%), modified in the laboratory (5.6%) and foods derived from GMOs (4.6%)

In a study conducted in Italy, 32% of the respondents claimed to have never heard of genetically engineered foods (Rosati and Saba 2004). In China, the majority of respondents (71%) had heard of transgenic food. However, this high percentage was most likely due to the government campaigns to raise awareness for the new labelling rules (Ho et al. 2006).

In this study population 34% had found out about GMFs from this study, 21% from television; 10% from newspaper; 9% from social media; 2% from radio and 24% from other sources (Fig. 2). In a study done in Kenya 38% were aware of GMFs mostly from television, newspapers and radio, whilst others had learned of GM crops at school. (Kimengu et. al. 2005)

When asked if they knew of any GM food products or GM food containing products being sold in Trinidad, the majority of 67.5% stated 'no', whilst 32.5% stated 'yes'. When shoppers were asked this question 'Do you think more can and should be done to raise awareness of GMFs amongst consumers?' A majority (97.6%) of respondents answered 'yes', whilst only 2.4% answered 'no'. The study revealed the need for greater awareness among consumers as 54.8% of respondents stated that they knew what GMFs were; with 44.4% of respondents who claimed to know what a GMFs was, actually demonstrating a true understanding of GMFs. Furthermore, 67.5% of respondents were unaware of any products being sold in Trinidad which were/included. The lack of awareness among consumers was further highlighted by 82.6% of respondents disagreeing that GMFs are well publicized in Trinidad. Additionally, when asked if more should be done to raise awareness of GMFs among consumers, an overwhelming majority of respondents (97.6%) answered 'yes'.

Moreover, a significant relationship between awareness and education was observed. Those with tertiary level education were significantly more aware of GMFs as compared to those with secondary and primary level education.

Moreover, significant relationships were observed between awareness and other variables. The results showed that younger respondents (<40 years) and those who displayed actual awareness of GMFs had a more positive attitude toward GMFs. The implications of these findings suggest that true awareness of GMFs leads to a more positive attitude among consumers; also that younger generations have a more positive attitude toward GMFs possibly due to a greater degree of actual awareness. Furthermore, the main concerns arising out of the study were those pertaining to food health risks, lack of awareness of GMFs among consumers, environmental risks and food safety.

### Benefits /Risks of GMFs

Fig 3 indicates that consumers were asked if the benefits and or detriments of consuming GMFs were well publicized in Trinidad, 42.9% 'strongly disagreed', 39.7% 'disagreed', 13.5% 'agreed', and 3.2% 'strongly agreed'.

Overall, a negative attitude was demonstrated toward GMFs with 61.2%

disagreeing that GMFs should be sold in Trinidad and 97.6% of respondents agreeing that all information related to GMFs should be placed on food labels. Furthermore, 71.4% of respondents stated that they were concerned that GMFs posed a substantial risk to human health with 40.5% of respondents stating that they were concerned that GMFs posed a significant risk to the environment. Some of the major concerns pertaining to the environment included pollution, adverse effects on plants and animals and the natural environment. The study also indicated that the majority of consumers (81.7%) thought that the government should be responsible for the regulation of GMFs perhaps the most telling statistic in terms of attitudes displayed toward GMFs was that 88.1% of respondents stated that they would consume non-genetically modified foods as opposed to GMFs if both foods were priced the same. However, it should be noted that more than half of the respondents stated GMFs can make a significant contribution to food security.

When shoppers were posed the question, 'do you think GMFs pose a substantial risk to human health?' 71.4% responded yes, 23% responded no, whilst the remaining 5.6% did not respond. In a similar study conducted by Kimengu et. al. (2005) more than one third of the sample population stated that their main concern was the possible effect of GMFs on human health. The findings of both studies are indicative of risk to human health being a major concern across nations. In a study conducted  by 7976 consumers in Ohio, US, of all the risks (pesticides residue in foods, contamination in drinking water, growth hormones in meat and milk, bacterial contamination, bio-terrorist attacks on food supply, mad-cow disease and GMFs) posed to food safety, GMFs was considered the least serious (Tucker et al. 2006). In a Greek study, only 28.8% of GM really  aware (strongly) agree that GMF is safe, while almost half of them believe that GMFs of animal origin are less safe than their plant origin counterparts, mainly because of the presence of toxins and hormones (Arvanitoyannis and  Krystallis 2005).

When asked if they believed that the development of genetically modified could pose significant risks to the environment, 40.5% responded 'yes', 51.6% responded 'no', and 7.9% 'did not respond'. Of the 40.5 % who reported that GMFs could pose a significant risk on the environment identified the pollution effects most followed by adverse effects on animal and plants (Fig. 4).

## Availability of GMFs in the supermarket

A question was posed to the shoppers whether 'genetically modified foods should be sold in Trinidad'.  Of those who responded to this question, 42.9% 'disagreed', 18.3% 'strongly disagreed',31.7% 'agreed', 5.6% 'strongly agreed', whilst the remainder(1.6%) did not respond.

## Labeling

Fig 2 shows the responses given by consumers to the statement that 'All information pertaining to GMFs should be placed on labels'. Most (76.2%) 'strongly agreed" that information on GMFs should be included on the labels. In a similar study conducted by Badrie et al. (2006), it was found that labels were important solely for warnings, information and advertising.  The view of labels being important as sources of information was common to both of these studies, as expected, due to the fact that both studies were conducted in the same general population, however with different respondents.

## Government Regulations

Most shoppers (81.7%)  responded 'yes', 14.3% responded 'no', and 4% did not respond when they were posed with this question, 'should genetically modified foods be regulated by the government'. In a similar study conducted in Trinidad (Badrie et al. 2006) it was also found that the majority of respondents held to the view that the Government were responsible for the regulation of information pertaining to GM food, with other possible regulators being the

importer, retailer education system (schools), places of worship (church) and others such as magazines, and scientific journals.

## Contribution of GMO's to Food Security

The statement, 'genetically modified foods can make a significant contribution to food security' was posed to respondents with 56.3% 'agreeing', 40.0% 'strongly agreeing', 20.6% 'disagreeing', 6.3% 'strongly disagreeing' and 2.4% being 'unresponsive'.

## Employment vs. Awareness

From the results it was observed that there was a significant P<0.05) relationship between awareness and employment status. For those individuals who were students (23%) and formally employed (57%), these displayed the highest levels of awareness, whilst those who fell into the categories of self-employed (10%), unemployed (6%) and other (4%) were the least aware of GMFs. This is possibly because the respondents who were students may have been more up to date with current information and trends concerning GMFs. Those who were formally employed were most likely in possession of formal education and thus were more informed on GMFs than the other categories. Those who were self employed and unemployed, displayed the least awareness, and this was thought to be because these groups possibly may not have had formal education or access to current trends and information (p=0.04).

## Education vs. Awareness

From the results it was observed that there was a significant (P<0.01) relationship between education and true awareness of what a GMF actually is. Ninety – three percent (93%) of respondents who actually knew what a GMF was were at the tertiary level of education, whilst the remaining 7% of those with genuine knowledge possessed secondary education and those with primary education (0%) displayed no true awareness of GMFs.

Furthermore, from the results it was seen that the highest percentage of those who did not actually know what a GMF is, had tertiary level education (63%). With respect to secondary education, 31% displayed a false awareness to what a GMF truly was, whilst a mere 6% of those individuals with primary education also displayed a false awareness and understanding to GMFs.

This is possibly because; even though the level of education had some level of influence on actual awareness on GMFs it did not have an overly significant influence. Tertiary level education had the highest percentage of actual and false awareness; this indicates there whilst there was exposure to information, there was a significant lack of true understanding of GMFs regardless of education level.

## Education and Products

From the results it was observed that there was a significant (P<0.01)) relationship between education and knowledge of genetically modified food products on the market. Seventy-six percent of those who knew of GMFs currently sold in Trinidad had tertiary level education. Additionally twenty-four percent (24%) of those who knew of GMFs were sold in Trinidad had secondary level education whilst no shopper with primary education knew.

Thus, awareness of products being sold in Trinidad with GMFs was directly related to education level. This was possibly due to greater exposure, knowledge and understanding of GM food products.

## Persons who gave the correct definition of GMFs vs. Overall Attitude

Those who delivered a correct definition of GMFs had a more positive attitude P<0.05) towards these food (mean= 8.333). However, those who gave a wrong definition showed a more negative attitude towards GMFs (mean = 7.059).This shows that a proper awareness and understanding breeds a more positive attitude among consumers toward GMFs.

## Publicity vs. Overall Attitude

Those who 'strongly agreed' (mean= 10.0) and 'agreed' (mean =8.24) that the benefits and harmful effects of GMFs are well publicised in Trinidad showed a more positive attitude ($P<0.01$) towards these foods. Those who 'disagreed' (mean = 7.78) and 'strongly disagreed' (mean = 6.792) that they were well publicized showed a more negative attitude towards GMFs. This indicates that publicity (which leads to awareness) creates a positive attitude among consumers toward GMFs while a lack of publicity (which leads to a lack of awareness) leads to a more negative attitude toward GMFs

## Conclusion and Recommendations

It was concluded that a large portion of consumers were not truly aware of genetically modified foods and this may have possibly lead to the majority of respondents displaying a negative attitude towards GMFs.

It is recommended:

1. A combination of newspapers, television and social media (Facebook, twitter etc.) can be used to increase consumer awareness and knowledge about GMFs.
2. Given the overwhelming perception among consumers that the government should be responsible for the regulation of GMFs in Trinidad, policies and programs should be implemented to raise awareness, particularly in the education system seeing that there was a strong correlation between awareness and education.
3. Proper legislation should be put in place by the government with respect to labeling GMFs so that consumers can make more informed choices as to their purchases.
4. Given that a proper awareness of genetically modified foods was directly linked to attitudes among consumers toward GMFs a substantial effort should be made by the government and

stakeholders to raise awareness such that consumers can make more informed choices as to which foods they purchase, be it genetically modified or non-genetically modified.

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**Table 1: Global area of biotech crops in 2011: by country million of hectares\***

| Rank | Country | Area (Million of hectares) | Biotech crops |
|---|---|---|---|
| 1 | USA | 68.0 | maize, soybean, cotton, canola, sugarbeet, alfafa, papaya, squash |
| 2 | Brazil | 30.3 | soybean, maize, corn |
| 3 | Argentina | 23.7 | soybean, maize, corn |
| 4 | India | 10.6 | cotton |
| 5 | Canada | 10.4 | canola, maize, soybean, sugarbeet |
| 6 | China | 3.9 | cotton, papaya, poplar, tomato,  sweet pepper |
| 7 | Paraguay | 2.8 | soybean |
| 8 | Pakistan | 2.6 | cotton |
| 9 | South Africa | 2.3 | maize, soybean, cotton |
| 10 | Uruguay | 1.3 | Soybean, maize |

*Rounded off to the nearest thousand
Source: ISAAA (2011)

**Table 2: Demographics of shoppers in supermarkets**

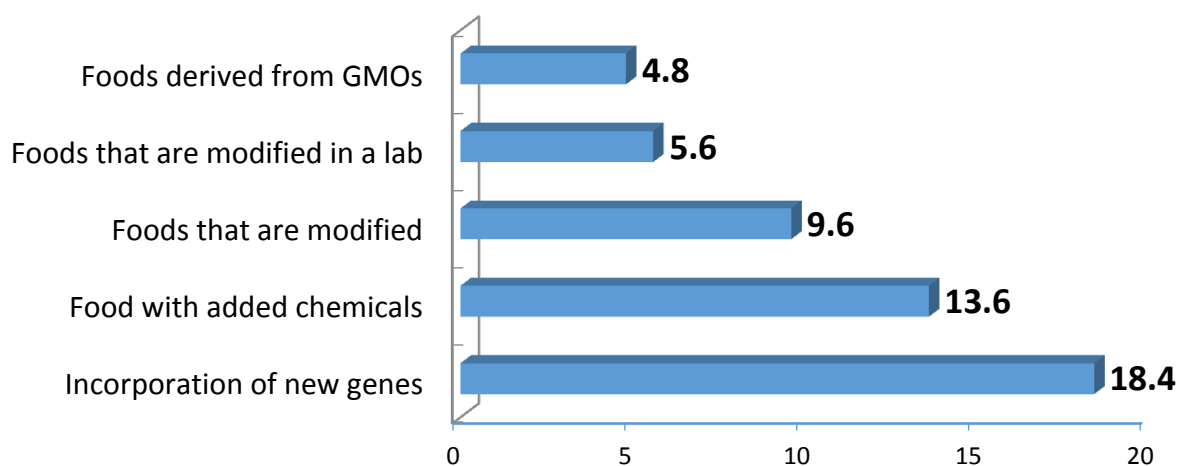| Demographics | Frequency | Percentage |
|---|---|---|
| **Gender** | | |
| Male | 61 | 48.4 |
| Female | 65 | 51.6 |
| **Age  (yrs)** | | |
| <18 | 5.0 | 4.0 |
| 18 – 29 | 42 | 33.3 |
| 30 – 39 | 35 | 27.8 |
| 40-49 | 28 | 22.2 |
| >50 | 16 | 12.7 |
| **Employment Status** | | |
| Student | 25 | 19.8 |
| Formally employed | 63 | 50.0 |
| Self employed | 14 | 11.1 |
| Unemployed | 18 | 14.3 |
| Other | 6 | 4.8 |
| **Education level** | | |
| Primary (5 years and less | 5 | 5.6 |
| Secondary (10 years and less) | 48 | 38.1 |
| Tertiary (more than 10 years) | 70 | 55.6 |

**Figure 1: Shopper's perception of GMFs**
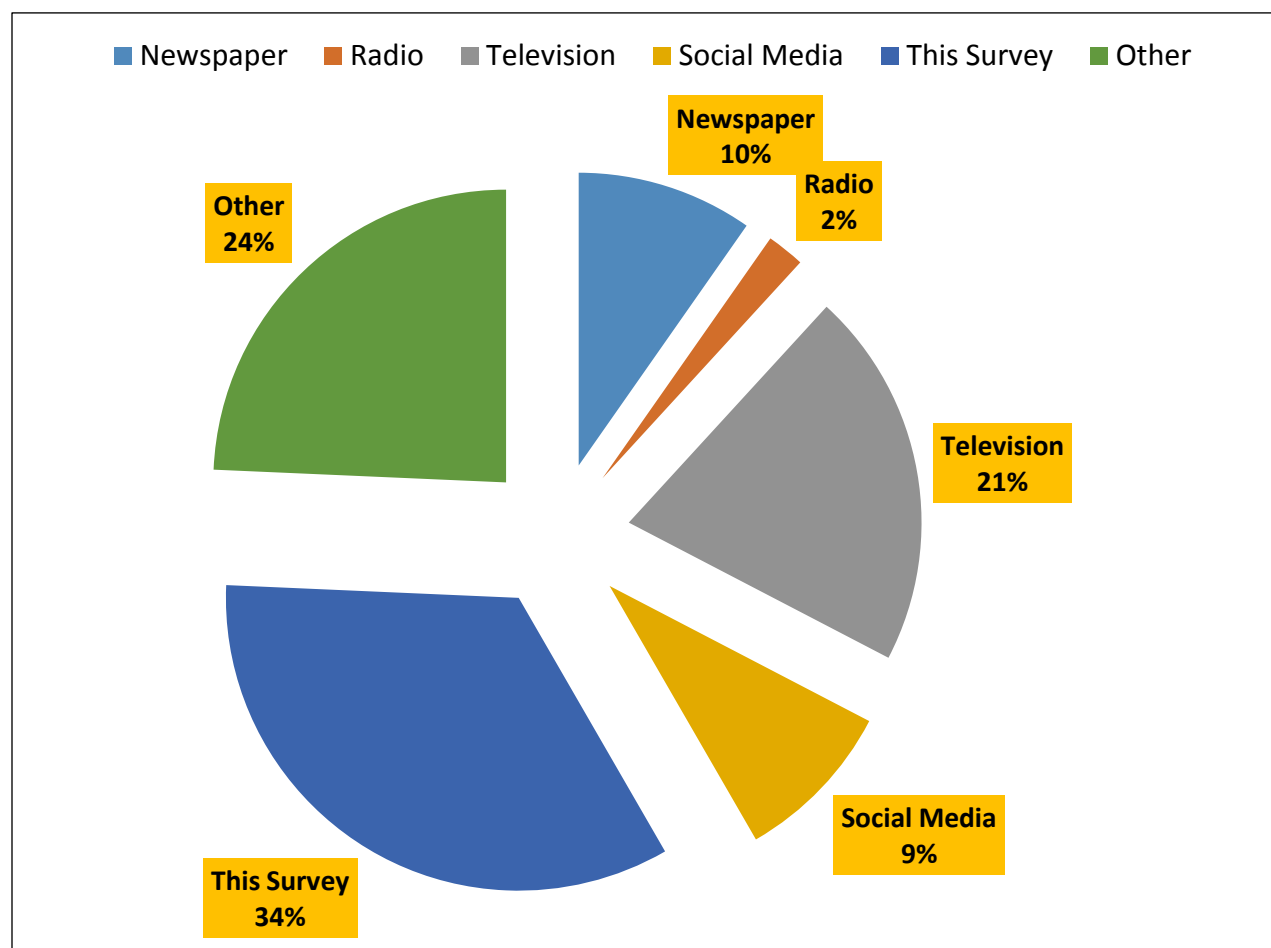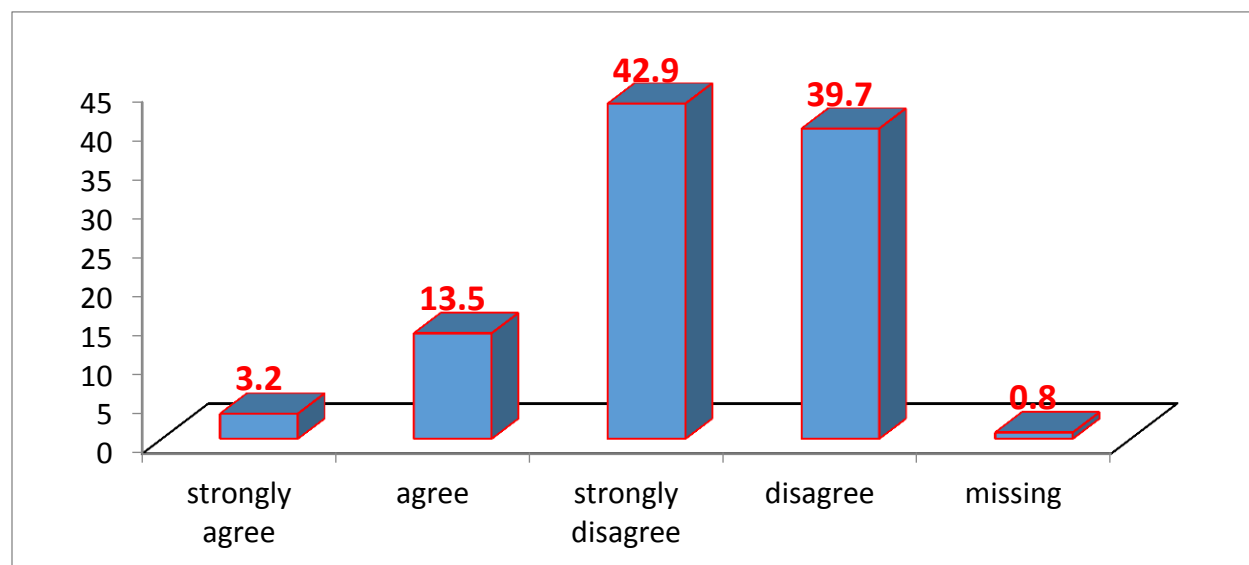


**Figure 2: Responses (%) of sources of GMFs?**

**Figure 3: Responses (%) Are the detrimental and beneficial effects of consuming GMFs well publicized?**
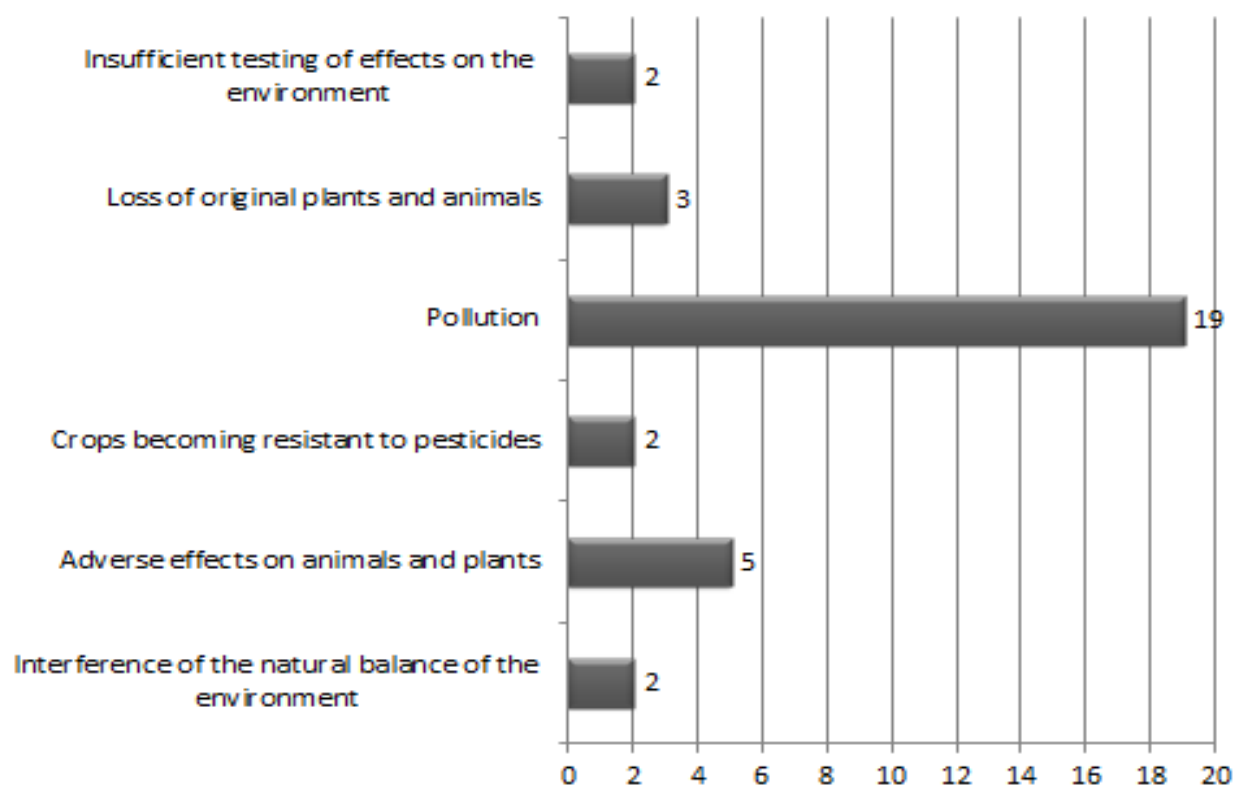


**Figure 4: Responses as to the perceived adverse effects of GMS on the environment**