

University of Kwazulu-Natal

Determining awareness, attitudes, and behaviours towards genetic modification of food
among consumers in Durban, South Africa

Sereesha Reddy

205503436

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Supervisor: Prof. M.E. Hoque

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Dedication

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Abstract:

Genetic modification has been in South Africa since the 1980's as a means to boost crop yield, however, to a consumer there is limited information available as to the understanding and known side effects of continuous consumption if any. Most manufacturers and retailers do not stipulate on the packaging items that contain traces of genetically modified organisms or was grown with genetically modified organisms. While most consumers in South Africa will claim they have heard of the terms GMO and MSG, few consumers will be able to correctly define the meanings of the terms or be able to say why they perceive it to either be good or bad for their health. The aim of the study was to determine the awareness, attitudes and practices regarding GMO food product. This was a cross-sectional quantitative study conducted among 104 consumers from the Pavilion shopping center in Durban who were recruited systematically. Results showed that majority of the participants were aware of genetic modification that happens in food products. While most of the participants said they regard modification as negative, this attitude did not effect any negative purchase and consumption behavior toward food products that are genetically modified. Whether positive or negative the attitude, most of the participants in the study claimed they would still buy and be willing to buy if food products that they were aware contained genetically modified organisms. The study includes a correlation analysis which indicated that there were significant negative relationships that existed between awareness and purchase of GMO food product ($p < 0.05$). The study also found a positive relationship between attitudes and purchase of the products ($p < 0.05$). The study aimed to determine whether the market for organic food in South Africa is as large as processed food, this appears to be a niche market that is only appealing to those who can afford it. The results for this study is beneficial to manufacturers and retailers that have a role to play in cleaning up their labelling and being transparent in the content of the food items.

CHAPTER ONE: OVERVIEW OF THE STUDY

1.1 Background to the study:

South Africa is the only country in Africa growing legally sanctioned commercial genetically modified crops (AfricaBio, 2013). Countries such as USA, Brazil, Argentina and India have allowed genetically modified food production (Adenle, 2017). South Africa is not unique to allow the sanction, the uniqueness lies in that, South Africa is that it is the only country in the world to have allowed the country's staple foods to be genetically modified which makes up 80% of the food manufactured. Monsanto's insect resistant maize, known as MON810 has been active in South Africa for the last 15 years (Monsanto, 2017).

Genetic modification was created to assist with crop production. This meant that crops would be available all year round regardless of climate and weather change, thus it will become easier to farm and will have cost advantages for farmers. Modification was able to yield a stronger crop through selective breeding.

Plant diseases and viruses caused by insecticides were causing crops to die, genetically altering the plant's genes allows resistance against such diseases. However, this resistance produces a toxin from the crop, this very same toxin when consumed by people, can lead to allergies and other negative health effects. A higher crop yield could come at the expense of a consumer's well-being.

A study that took place in Quebec Canada involving pregnant women, showed that nearly all women and their fetuses show high levels of toxins which are the result of consumption of genetically modified food (Aris, 2011). Bakshi, (2003) states that consumption of food that has been genetically engineered can lead to allergies in children and adults, increased toxicity levels, decreased nutritional value and resistance against anti-biotics.

There have been several studies that indicate consumption of genetically modified foods can lead to fertility problems in rodents (Bawa & Anilakumar, 2013). For example, a study in Brazil revealed that a female rat develops significant changes in her uterus after the

consumption of soy for 15 months (Huang, et.al, 2011). Similarly, a study in France revealed that glyphosate can kill outer cells of the human placenta. Food that contains genetically modified organisms are maize, soy beet, cotton and barley. According to the consumer protection act (CPA) of South Africa, a trade description, label or reel is required on the packaging of any food item is to be displayed because the consumer has the right to information on the content of the product (South African Government Gazette, 2009). Display on food items stipulating that it has been genetically modified is not clearly found on packaging. It is mainly found at the back of the pack, in rather small text, as a means to take away the focus that the item has been genetically modified. Over the years been many myths about genetic modification and a negative attitude toward its consumption through food has arose with consumers.

This chapter will cover the motivation for the study, the problem statement, the research objectives and questions will be defined. A brief overview of the expected outcome, the methodology, assumptions, limitations, definition of concepts and chapter outline will also be given.

1.2 Motivation for the study:

With an increase in South African consumers becoming more health and fitness conscious, there has been a trend for consumers to seek out more healthier choices in the food they consume. Maize is a staple food in South Africa, a large majority of our population are at risk should there be defects in the quality and input to maize. There is a large composition of the population dependent on the yield of maize for survival, it is worth looking at the awareness of consumers on genetically modified food.

Understanding what are the consumer's perceptions and preferences for genetically modified food. By trying to unpack what proportion of the consumer's food basket comprises of genetically modified food, then gaining insight as to whether consumer's have opinion of whether they consider genetically modified food to be negative for their health or not. Consumers have a right to all information regarding their health and the ability to make choices on what they believe is good or bad for their health.

1.3 Focus of the study:

The focus of the study was to explore how awareness of genetic modification in food products caused a behavior change with respondents that shopped at the Pavilion mall. The study also explored whether there was more of a positive or negative attitude toward gene technology and genetic modification. The study will offer public interest and policy for the South African government to carry the insights in to the framework to encourage more organic farming by 2025.

The study will provide insight and knowledge for businesses, manufacturers, retailers and scholars who are interested in food production using genetic organisms and technology.

1.3 Problem Statement:

There has been a myth and the perception that consumption of genetically modified food is bad for your health (Global Citizen, 2016). There is however, little information that proves this perception true. There is a need to debunk this myth and understand whether the negative attitude toward genetic modification translates to behavior where they either reject the food or are not willing to purchase at all. Food manufacturers suffer loss in sales of food items that contain MSG and GMO but little information exists that show the reason could be attributed to a negative perception toward these concepts (Hofbauer, 2016). Although most of our food products in South Africa has been genetically modified and sometimes contain traces of genetically modified organisms, there appears to be little to no awareness on the packaging and labeling of these items (Department of Agriculture, Forestry and Fisheries, 2015).

Consumers lack knowledge and information on food manufacture, the technologies used in food production and genetic modification of food (South African Government Gazette, 2009). There is a need to understand whether consumers reject genetically modified food or reject the technology used to manufacture.

1.4 Research Objectives:

- To determine the level of awareness and knowledge of GMO product among the consumers in South Africa.
- To understand the perception of the term GMO among the consumers.

- To investigate the proportion of consumers looking at the packaging or labelling when shopping for food.
- To determine the relationship between awareness of GMO and purchase of GMO product.
- To compare the level of awareness and knowledge of GMO with socio-demographic variables.

1.5 Research questions

- What percentage of consumers in the South African context are aware of GMO products, what is their level of knowledge of GMO?
- Do consumers have a positive or negative perception of the term GMO?
- Do consumers look at the packaging or labelling when shopping for food?
- Is there a relationship between awareness of GMO and purchase of GMO product?
- Is there a relationship between the knowledge of GMO to socio-demographic data of the consumers?

1.6 Expected outcome

The expected outcome of the research is to determine whether consumers change or make purchasing decisions based on their awareness toward GMO and does labelling and awareness toward packaging information have a role to play in this process. The action from this would be to inform large producers of food and retailers that should consumers consider genetic modification a barrier, all food items or products sold that has been modified should carry a stamp or some form of identification to make it easier for the consumer to identify.

1.7 Methodology:

Proposed method of research is to use a quantitative method approach, to determine the awareness, usage, attitudes and perceptions among South African consumers in the Durban metropolitan area. The study will take place at Pavilion shopping mall which is one the busiest malls in the Durban area. Respondents were asked to participate in a self-administered questionnaire. The researcher assisted the respondents and captured feedback for the respondent through QuestionPro, a web based method if they voiced or showed struggle in using the tool.

Validity: This nature of study has never been done before, questions leading to whether a consumer awareness and preference for GM versus non- GM has not been explored. A study conducted on white maize for consumer perception and market segmentation using a conjoint analysis was the motivating source to dig deeper to understand from a consumer's perspective to understand whether genetic modification had any negative effect on the purchase intent (Vermeulen, 2004).

1.8 Assumptions:

An assumption to consider for this study is the effect of using an online method to gain feedback and assuming the level of literacy of using an online tool. We are also assuming that all respondents approached exhibit an attitude, or behavior toward purchasing food. This attitude is either positively or negatively affected by genetic modification of food.

1.9 Limitations:

- There is a lack of research in South Africa that has been conducted among consumers for their attitudes, awareness and usage of genetically engineered food (Vermeulen, 2004).
- The literature that does exist is limited to urban and not rural consumers who eat maize meal (Vermeulen, 2004). Conducting research with rural users is perhaps not easy and may be limited to users who are not aware or have knowledge to genetically modified food. These consumers may make purchase due to budget constraints and what is available on shelf at their local general trade store.
- From the literature found in South Africa there is little medical research to show the testing of individuals who have been eating genetically modified maize meal over a sustained amount of time and the probable health risks from the effects of consumption.

1.10 Definition of concepts

Genetically modified organism (GMO) - genetically modified organism, plants or animals whose genetic makeup has been changed through human intervention or unnatural recombination (WHO, 2017).

MSG- Mono Sodium Glutamate, found in a variety of processed and packaged food (WHO, 2017).

Free Range - Was grown without force feeding. A system of keeping animals in which they can move and feed. Free-range animals are animals that have some access to the outdoors (Chait, 2017).

Organic - Plants are grown using farming methods that promote biodiversity and environmental sustainability (FAO/WHO Codex Alimentarius Commission, 1999).

Processed (Food)- any food that has been altered during preparation. Examples of processed food is canned, frozen, baked or cured. There is generally a negative attitude with consumers toward processed are considered to be unhealthy because of high levels of salt, sugar and fat (Renee, 2017).

1.11 Chapter outline

Chapter covers the background of genetic modification and the effect of modification in other countries. Other areas covered in this chapter include the focus and motivation for the study, the methodology, expected outcome, limitations and definitions of concepts in the study. Chapter 2 is a review of literature, gaining insight in to how consumers in other countries behave toward modification. It also goes through the reasons and importance for modification, it also shows evidence of other pieces of research in different countries to show what impact consumer behavior, attitudes and beliefs had toward purchase intent. Chapter 3 is based on the research methodology, which is a quantitative approach. Chapter 4 entails the consolidation of the results of the study, using statistical analysis to interpret and make inference and stories of the results.

Chapter 5 is a discussion of the research findings and a comparison between the different studies conducted in Italy, Sweden, Norway and the United Kingdom. Chapter 6 covers the conclusions and recommendations.

1.12. Summary

This chapter highlights the problem statement and need for the study. The chapter gives a brief view of the definition of GMO and understanding why the researcher wishes to determine

awareness and attitudes of this concept. The proposed methodology, validity and limitations also gives a framework to set the context for the rest of the chapters.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

South Africa is one of many countries that has allowed genetic modification on its staple foods. What makes South Africa unique to the rest of the world is that the country has allowed a staple meal, maize, to be genetically produced (Williams, 2007).

Most of South Africa's locally produced agriculture is grown through use of genetic modification. Limited information hampers the consumer's understanding towards the health dangers posed by the genetic modification process. Labelling of food that contains genetically modified organisms remains a gap for the consumer's knowledge and using this information to make informed choices.

According to the African Centre for Biosafety who is outraged at the lack of consumers awareness around potential health risks in the consumption of GM crops, South Africa is alone in permitting maize which is a staple in the cultivation of the crop (Mayet, 2007).

2.2 The definition and evolution of genetic modification

According to the World Health Organization the definition of genetically modified organisms are either plants or animals whose genetic makeup has been changed through human intervention or unnatural recombination (WHO, 2017).

Through this, scientists are able to favor or select individual genes to be transferred. Foods that is manufactured using gene technology is called genetically modified food. Consumer awareness on the composition of the food they consume has not been a focus as a result of the expansion in the quantity of processed food consumed (Davies & Schlosser, 2002).

As a result, through this lack of awareness or lack of information availability to food nutrition and production there is little concerns that consumers voice towards pathogens, toxins and allergens contained in food. Nutrient composition is not a primal feature in the consumer's decision- making process (Liakopoulos et.al, 2009). Typically GMO, is created in a lab through altering the gene of either animal or plant matter.

Research published by the Consumer Reports National Research Centre reported that 92% of Americans believe that GMO foods should be labelled and is the right of the consumer to have information on the contents of any food item bought and consumed. This survey contained a sample of 1004 respondents across the US and were tested using various packaged food such as breakfast cereals, chips and baking material all of which is commonly found in all households across the country (Gilbert, 2013).

Genetic modification mechanisms could take on one of a few methods, either through the moving genes from one organism to the next, it could also result from multiplying genes in a single organism then transferring to it another. Another method of modification relies on engineering new genes and building them into a new organism. Genetic modification has many uses one of them is human insulin production for patients who suffer from diabetes.

Insulin was gathered through the pancreas of a slaughtered pig, insulin is now manufactured through the use of GMO's (Bergmans et.al, 2008).

Another function found was the production of improved vaccines for animal disease. In the case of plants modification enabled the plant species to survive harsh environments and greater resistance against pesticides and herbicides. GM plants that are popular in South Africa and throughout the world are maize, soya, oilseed rape and cotton. These plants have been tested and has shown significant growth in the resistance towards insects, pests and rodents (Enserink, 2008).

2.3 Understanding the aim of genetic modification in food production and agriculture

Genetic modification in plants has largely contributed in the context of developing and emerging market economies that rely on staple food crops to be produced in large quantities. By genetically changing the make up of plants to boost nutritional value this counteracts malnutrition (WHO, 2017).

The development of “Golden Rice” demonstrates an excellent example of how using plant technology can offer a solution for farmers in developing countries to boost nutritional content through genetic engineering (Goodman, 2016). The “Golden Rice Project” was used to introduce “correct metabolic steps into rice endosperm”, by doing this it introduced β -carotene into rice which previously was only found in cereal grains and is found to improve blindness

in children. Vitamin A deficiency is one of the leading causes of death in many developing economies, the introduction of β -carotene into rice means the nutrient became a part of the population's staple meals. β -carotene acts as a precursor for Vitamin A absorption (Goodman, 2016).

Increasing food production through genetic modification is an example of why governments advocate the use of technology to farm. Insect and virus resistant crops assist to conserve the yield produced. In the US resistance has been successful to protect against bacterial and fungal resistance (WHO, 2017).

As the world and science and technology moves closer to water and environmental conservation, some scientists believe that genetic modification in plant cultures can provide a solution to counteract plant loss. Plant loss is majorly caused through drought, salinity and abiotic stress. As we see in our own country water resource decline in the lower lying and Western Cape region this situation has a serious impact on the salinity of arable land (Berrie, 2011).

A study by Shou shows that the enzymes in genetically modified maize "activates an oxidative signal cascade" that grants tolerance to heat, cold and salinity (Shou et al., 2004: pg.290).

There is a perceived advantage that genetic modification will either increase the yield of the product being grown and this leads to cost advantages. There is also a notion that genetic modification improves nutritional value and durability of the crop. However, limited research is available to prove this (Key, 2008).

One key objective why South Africa invested in genetic modification was to protect plants against the insect population that eats into it (Vermeulen, 2004). Genetic modification was trialed to improve the resistance against plant disease caused by insecticides, insects and viruses that cause plant damage. This is achieved through incorporating into the plant *Bacillus thuringiensis* (Bt) (Ronald, 2011).

This is to incorporate the gene to produce toxin and this will cause GM crops to show higher levels of protection against infestation because the toxin helps to lower the quantities of insecticides required. "Virus resistance is achieved through the introduction of a gene from

certain viruses which cause disease in plants. Virus resistance makes plants less susceptible to diseases caused by such viruses, resulting in higher crop yields” (WHO, 2014).

“Herbicide tolerance is achieved through the introduction of a gene from a bacterium conveying resistance to some herbicides. In situations where weed pressure is high, the use of such crops has resulted in a reduction in the quantity of the herbicides used” (Lee, 2014:pg 492).

2.4 South Africa’s role in genetic modification

Genetic modification is a term used post 1994, previously ‘organisms with recombinant DNA’ was more commonly known. South Africa has many competitive farmers that are willing to test new technologies to better their yield and become more profitable in producing. As of 2012, of the maize exported from South Africa, 86% has been genetically modified (South African Grain Laboratory, 2013). South Africa has had many in roads made in the genetic modification and South Africa has played an instrumental role in the introducing Africa to modified cotton. South Africa is home to highly sophisticated commercial farmers this is one of the reasons why CSIR granted funding to the South African Genetics society (SAGENE) to achieve compliance from the US NIH (Bawa & Anilakumar, 2013).

Many of South African Genetics society (SAGENE) members had close links with the biotechnology industry and were nominated onto SAGENE by the South African Chamber of Business. Initially GMO trials were stimulated through the Bt Cotton project using four farmers in the KZN region. American agriculture company Monsanto, in 1997, partnered with SAGENE to convince smallholder and subsistence farmers to plant Bt Cotton seeds (Zapeda, Gruere, Sithole-Niang, 2013).

AfricaBio, an organization established by Professor Jocelyn Wright whose members also included academics, grain traders, seed growers and retail food manufactures, also fueled South Africa becoming an early adopter of the GMO activities (Gouws, 2015).

South Africa at the time was in deep need of cost effective ways of producing maize, one of the countries staple meals. AfricaBio was an enabler in agricultural biotechnology (AfricaBio, 2013). Most of the adopters of information from AfricaBio came from one of the SADC (South African Development Community) regions seeing the success the company had in South

Africa. Kenya was also a beneficiary to AfricaBio's information exchange, training and advice. Naturally, AfricaBio through its founders has released insights, learnings and impacts to sustainable agriculture in biodiversity. Historically the first GM maize that was planted in known as MON810, grew immensely but failed as a result of insect resistance. 73% of all maize meal in the market is grown by one out of three manufacturers in the countries (Zapeda, Gruere, Sithole-Niang, 2013). This leaves very little room for promotion of new mechanisms to grow agro- ecological production systems.

The Consumer Protection Act (CPA) was enforced in 2011, requiring all products to be labelled if they contain 5% or more GMO content. The SAGENE has had a fundamental role in the regulation of genetic modification in South Africa (Biosafety, 2017). A consumer campaigner for the African Centre for Biosafety claimed that South Africa adopted the GM technology as there is currently no civil society engagement in place for the prevention of GMO and GM food (The South African Health News Service, 2016).

2.5 Awareness and attitudes toward genetic modification, MSG

Studies show that consumers have negative attitudes and perceptions toward labelling but there is little research that shows why (van der Merwe, 2010). Consumers prefer clean labelling that has few items listed on the nutritional content and ingredients contained, these negative perceptions can cause consumers to make choices based on their understanding of the information on the labelling (Venter, 2010). Food manufacturers have an ethical and moral responsibility to truthfully provide information on the labels of products. Food manufacturers have a role to educate consumers on food labelling (Scott-Thomas, 2013).

A study with Malaysian consumers' attitudes, perceptions and willingness to pay towards food products that contained "no added Monosodium Glutamate (MSG)" on the label revealed the consumer's awareness levels and their buying behavior. The study used a critical value technique to assess the decision to pay a premium on products that did not contain MSG. Results showed a strong relationship to the determinant of willing to pay was the household size, household income, and the university level of the respondent (Radam, 2010).

A deduction from the study can be made in that education about MSG was a key determinant on the choices and buying behavior for these respondents. This then goes back to the role manufacturers, government, policy makers and marketers have in the education of consumers

on MSG. The study also revealed that respondents were aware of the term MSG but had little understanding of what it meant (Radam, 2010).

The government should strengthen its effort in informing the public about safety issues and policies related with MSG by exploiting the services of mass media. The perception of “no added MSG” should be cultivated to be positive and food regulation should require that all labeling of food items should contain an indication of whether MSG has been used or not. The government and policy makers should work together to co create a certification system so that all manufacturing and consumer goods companies comply or meet the minimum standards on MSG in their food items (Radam, 2010).

2.6 Attitudes and behavior towards genetically modified food

The decision making process is driven by consumers’ perceptions and attitudes. State of mind and mental awareness of the consumer is affected by internal and external environmental stimuli such as economic, social and cultural influences. Behaviors and attitudes are noted as an internal response, which is partially affective in nature and considered to be continuing evaluations of objects, issues or persons (Mostert, 2006).

There remains little or limited information when it comes to how consumers feel, what is their attitude and behaviors towards genetically modified food. In South Africa, there is limited information and research working papers that show the consumer’s lifestyle and health choices towards genetic modification in the food products bought and consumed. Previous research has been carried out on consumer attitudes toward genetic modification and the acceptance rate, countries included in the study were Denmark, Germany, Germany, Italy, and the United Kingdom. Respondents were asked to base their decisions for yoghurt and beer toward genetic modification and their willingness to purchase knowing the product contained traces of GMO as well as might have technology used to enhance certain product features through gene technology (Grimsrud et.al, 2002).

A total sample of 2031 respondents were interviewed in a self- administered survey across these four countries. Italian consumers are less negative than Danish, German and British consumers to genetic modification. Attitudes and behavior towards genetic modification in this study proved to be correlated to nature and technology, more so towards technology.

These attitudes did influence the consumer's view to the risks and benefits of using technology to manually alter genes. The study also showed from a consumer's buying perspective that the attitude determined whether the purchase was made or not (Buiatti et al, 2013).

A consumer's perceived value, either through delivering on quality or trustworthiness is influenced on their attitude towards genetic modification and this could either be negative or positive (Burton et al., 2001). Consumers reject genetically modified food overall and do not view or evaluate based on specific food items.

A study in Norway conducted through empirical research to understand willingness to accept GMO food based on giving a consumer discount. The results demonstrate that consumers are not likely to purchase even through there is a discount given, the more information and education on GM they possess the less likely they are to accept GM food (Grimsrud et al., 2002). A better understanding of Norwegian consumers' attitudes and behavior toward genetically modified food products and how these attitudes affect the purchasing choices for such food products is essential for marketing GM food products in Norway (Bawa & Anilakumar, 2013). The study analyzed consumers willing to purchase and accept GM food, it also indicated that there is a fair amount of skepticism to try GM food with average "willing to purchase GM bread with a 47.7% discount and GM salmon with a 56.0% discount compared to the corresponding non-GM product". A gap identified in the research showed that younger people are more willing to try (Wunderlich, 2015).

2.7 The trend for organic food in the South African consumer market

By definition organic agriculture is a production system that sustains the health of soil, ecosystems and people. In order to achieve this the process needs to incorporate the ecological process, biodiversity and cycles. Organic agriculture combines tradition, innovation and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved (International Federation of Agriculture and Movement, 2017).

Spurring the organic and natural foods industry transformed what was a niche market into a "double-digit growth sector with sales estimated at \$12.6 million US dollars as at 2001", indicating the impact and growth forecast of this trend.

‘Organic’ refers not only to the food itself but also to how it was produced. Plants need to be grown using farming methods that promote biodiversity to effectively promote environmentally sustainable farming (UC Davis Agricultural Sustainability Institute, 2016).

This means that unlike traditional farming methods the use of synthetic pesticides, bioengineered genes, petroleum-based fertilizers and sewage sludge-based fertilizers is not to be used. Along with plants livestock must have access to the outdoors and be given no antibiotics or growth hormones in order to be classified as organic (Biltekoff, 2016).

Organic foods may not be irradiated. Consumer demand for processed food has grown and the same trend is seen for organic, free range, sustainable growing and fair -trade grow. As consumers become more discerning about what they eat and more are willing to pay for better-quality foods or those for special diets, many small food makers are carving out toeholds in this fast-growing marketplace (Baranski et.al, 2016).

The trend is not surprising, considering that about \$45 billion is spent on organic food every year in the United States. This has had a spill -over effect maybe not to the magnitude as the US but South Africa has also developed a need for organic food. Across the US organic products are available in 3 out 4 grocery stores (Nutrition Business Journal, 2014).

On a global scale, the market for organic, functional allergen-free and better-for-you foods will reach a record \$1 trillion in 2017, according to Euromonitor International (Euromonitor, 2015).

Increasingly more shoppers seek out organic food but it needs to be affordable and consistently high quality all year round for it to be considered a viable option. The popularity of organic food began with fruit and vegetables, but this now changing with customers exploring areas such as grocery, fish and dairy. Chairman of the Organic Trade Board recently won EU funding to assist in the promotion of organic food in Britain and Denmark. The two main challenges for customers buying organic are the price and the availability. Over the past decade this has improved across the industry and now the organic market is in a clear growth phase in the UK (Nielsen, 2017).

The rise of the millennials and their attitudes toward conserving the environment has over taken the position processed “fast” food once enjoyed. Companies such as Woolworths, Unilever and Nestle have heeded the call for sustainably producing food that is not harmful to the environment and has leveraged off programs to grow their brands in doing so.

To a South African consumer there is an established awareness on organic, free range, “grass fed”, however there is little evidence that suggests that consumers are clear on each term. Well known food producer, Woolworths, has been a pioneer and was the first to introduce “free range” and now carries the definition for consumers on their official website (Woolworths, 2017).

The burst of the organic food market has led to mushrooming of fresh food markets that exist in Gauteng and the Western Cape. According to the industry’s statistics the organic food industry has seen a growth of 3,400% in the last 24 years. This fact is largely backed up by consumers who place a value on transparency. They want to know what is in their food.

Organic food brands seem to be able to tell a more compelling, meaningful story that is able to connect with consumers more. A clear example of telling a story is the Plum Organic’s founder Neil Grimmer’s story. Neil owns a business that is estimated to be worth \$93 million as of 2012, all it took was for him to create baby food by sharing his own personal journey and the efforts made to make organic, healthy food for his children. Closely related to engaging, organic brands are able to link the brand’s proposition to their social missions and causes (ERS.USDA, 2017).

Government policy in the regulation of crops and plants has not however bought into organic translates to sustainable. Government still favors GMO to organic due to the crop yield and the risk in the growing conditions which GMO is able to eradicate. The World Bank Report (2008) is not in favor of organic as it is toward GM, this is due to the food security problem and in order to maximize production, the use of synthetic chemicals and engineering of animals and plants is required. Organic farming is an opportunity for smallholder farmers, the industry poses high barriers of entry as there is a cost of certification, the process is quite bureaucratic and the cost of the certification is about R3000 per annum. Organic production can however be quite costly and risky due to the technology and chemicals used. The demand for the crop may also vary from month to month. Switching to organic has not proven to be very lucrative for smallholder agriculture because farmers tend to feel that organic does not benefit the whole society. It tends to favor a select elitist that are able to afford organic. They also argue that while it might reduce ecological damage caused by industrialized farming and poses lesser health risks it also assists to free smallholder farmers of the industrialized agribusiness it exists in.

Organic agriculture will become the future of farming in South Africa. While formal certified farming may account for servicing a small sub-set of the population, informal farming is able to feed about two-thirds of the population. Organic farming is not as complex as the agricultural sector and in the future may either become mainstream or work hand in hand with the agricultural sector. Organic farming complies with the agenda of sustainable agriculture, Clean Development Mechanism and pro Green and Clean Economy by the South African government (National policy on Organic production, 2016). According to the Nutrition Business journal, the demand for non- GMO as at 2013 increased by almost 80% in the last 5 years. This has prompted many manufacturers and retailers to avoid the use of GMO in the production of food or alternatively using labels to show that GMO is present in the food item (Blumenfeld, 2014).

2.8. South Africa's draft policy to organic production

A clear vision is being developed under the Organic Sector Strategy Implementation Committee- South Africa (OSSIC-SAOSO), this is to prevent an elitist euro- centric group of organic farmers that will protect intellectual territories and become dysfunctional (South African Organic Standards, 2015). The organic sector is highly fragmented with many smaller players. The policy has been set in motion for many reasons one of them is to aid the consumer. The policy favors the consumer in protecting them against paying a premium or paying the wrong price without their knowledge.

There currently is a lack of policy framework in regulating organic products. The need to improve health and nutrition for society as a whole is still a clear benefit of organic farming. Organic farming must seek to reduce public exposure to harmful chemicals that causes immune impacts and adds to the strain on health. This causes government to shift their focus and adds to the strain on the poor and social services (Prince & Black 2010).

Studies show that organic farming enhances soil structures, conserves water and enhances sustained biodiversity.

Organic farming is able to integrate wild biodiversity, agro- biodiversity and soil conservation. Cost reduction in farming is achieved through the reduction in pest control measures and controlling diseases. Herbicides and insecticides traces are in our food systems which poses a threat to consumers' health (Aktar, 2009).

There are more than 500 reported additives in food products some of which can cause heart disease, phosphoric acid can break down calcium needed for bone formation. Mono Sodium Glutamate (MSG) symptoms can cause dizziness, headaches and asthma (Shan, 2006). Persistent use of pesticides may cause reproductive failures and can result in endocrine abnormalities in both human and wildlife. Human beings resistance to antibiotics is believed to be as a result of injecting livestock with antibiotics to prevent disease. Organic production of food does not only aid in the health of consumers and wildlife but also reduces drain on the healthcare system because of the reduction in chemicals and pollutants (Nogrady, 2013).

As the world moves toward food sustainability and growing food that is not harmful to the environment, organic food production has a role play. Developing systems to mitigate climate change must be taken seriously by policy makers in South Africa. Organic food production is beneficial because not only can it assist in counteracting climate changes negative impacts but it also aims to build stronger farming systems. Through the creation of stronger farming systems there will be better planning for food security which reduces poverty.

“Organic production emits much lower levels of greenhouse gases (GHG), and quickly, affordably and effectively sequesters carbon in the soil”, non- nitrogenous fertilizers are used which improves plant biomass. This encourages the prevention of nutrient loss and preserves the agro -ecological system. Farming systems are strengthen to conserve water this results in a lower risk to crop failure (National Policy on Agricultural Production, 2015).

It is the constitutional right of South Africans to make a choice in the variety and types of food they eat. This right is exercised through the use of organic production of food. It is the right of the consumer to choose based on medicinal benefit, based on price, functionality and availability of the products. Choosing based on these factors can be expensive to meet all the requirements mentioned. Organic labor provides a means to assess the full view of the farming process assuring that the agriculture and farmers are not compromised. Some would argue that organic production only caters to a select few who can afford it, but the proponents for organic farmers recognizes the essential role of the farmer and gives a voice to smallholder farmers and encourages fair trade for these farmers. Producing more organic foods will increases the change of price deduction and affordability (Wolson, 2007).

There are both economic and cost capital benefits for organic food production. The production of organic food is not dependent on the effect to yield to fertilizers, pest and disease control.

There is a huge cost saving through reduced production costs and this means more consumers have access to organically grown crops. Organic food production entails food production through minimal investment. Self-subsistence would be accompanied by self-employment which, in turn, would contribute to a progressive transformation of the informal economy and rural /peri-urban sector into a more vibrant economy characterized by more substantial and durable incomes and reduced inequalities (Department of Agriculture, Forestry and Fisheries, 2015).

The main agenda is to drive integration and inclusivity by organic and surplus farming and create a unified sustainable agricultural sector. “Two distinct groups are emerging with different agendas:

- The subsistence and surplus organic community farmers mainly supplying local markets.
 - The third-party certified organic farmers catering for larger retailers and export markets”
- (Department of Agriculture, Forestry and Fisheries, 2015).

A lack of accurate information organic farming has led to the failure of this market to expand. Both farmers and processors need both expert and market knowledge to make decisions. There is a lack of information on organic production techniques and methods. It is the lack of advocacy and knowledge that limits the production and sustainability of organic food systems. Through the government recognizing the need for the organic market together with commercial farming the impact and potential of agricultural farming allows smaller farmers the opportunity to have a significant impact on the food production market.

Due to the number of messages that consumers are bombarded by in the media about organic food it still remains a challenge that consumers are still not sure of all claims made on labels of products. So much so that this remains a market that is not regulated and consumers who do by organic are at risk to being vulnerable to claims made by producers on what is perceived as organic. The perception that organic is only for the elite remains clear. Some labels do carry information traces of material that may be harmful or cause allergies for commercially grown conventional crops, but this is not obligatory for food producers to do so under South African consumer law (Barrow, 2006). Consistent labelling across both organic and non -organic produce will serve the purpose of allowing consumers to make smarter, more informed decisions about their lives and food. Organic food market is still very niche in South Africa and due to this it makes entering this market rather challenging, certification requirements

proves to be a market barrier for aspiring emerging farmers that have recognized and wish to foster untapped markets (Barrow, 2006). The perception of consumers in South Africa is that organic is only for the elite and because it is so niche does not actually create new jobs, however this is not necessarily true as studies show that farmers are able to yield 4 times more nutrition in their produce and 32% more jobs per hectare (Department of Agriculture, Forestry and Fisheries, 2016).

2.9 Health consequences and risks from GMO consumption

As consumers in South Africa with limited information about GMO, there has been a public interest as to whether GMO affects the environment and a consumer's health. These specific concerns are centered around nutritional content, allergies, toxicity, organ damage and gene transfer. There have been studies which indicated that consistent consumption of GMO in rodents resulted in high levels of toxins (Huang et al., 2011) .

The Centre for Environmental Risk Assessment has a database that can be used to find crop history, regulation and methods of modification. Other notable institutions that have tested genetic modification has been the American Medical Association and the World Health Organization (WHO, 2017). Both of these organizations mentioned have concluded that genetically modified food poses no risk to a consumer's health. One of the issues tested for was toxicity. This relates to mutations as a result of consumption of foods that have been modified. It may also include damage to organs and dangers related to pregnancy. The Institute for Responsible Technology ran a test which proved that GMO contained in potato that was fed to a rodent for 10 days caused toxicity and every organ had been negatively affected as a result of this. This institute then claimed that all GMO's were high risk for toxicity.

Scientists at the National Institute of Toxicology research in Seoul found rats that were fed GMO potatoes versus non GMO showed no differences in their spleen. Following this study a separate group of scientists tested 4 diet groups of rats that were fed non- GMO tomato, GMO tomato, non GMO sweet pepper and GMO pepper. The results were that there was no found differences to stomach, liver, heart, kidney, spleen an reproductive organs (Bawa & Anilakumar, 2013)

Scientists in the United States have rigorously tested toxicity as a result of GMO on health and have found no evidence that proves there is a cause for concern. It is not ethical to run

experiments on human beings, rodents such as mice and rats can however predict a similar impact to that of human beings. South Dakota university released a study to test the effects of GMO on fertility through testing embryos of rats during gestation. In this particular study rats were eating Bt corn, in order to address the toxicity equation, there were 2 groups. 1 group of rats ate Bt corn over a lifetime and they tracked another generation of rats that also ate Bt corn, the results showed that both generations showed no effect to consumption of GMO. “To examine the affect of Bt corn on testicular health, the researchers tracked testicular development in fetal, postnatal, pubertal, and adult rats for all four generations. The group found no change in testicular health or litter sizes in any generation. Likewise, ingestion by pregnant mothers had no effect on fetal, postnatal, pubertal, or adult testicular development of her offspring.” (Bawa & Anilakumar, 2013, pgs. 239- 242). Genetic mutations in DNA that cause cancer have also been a growing cause for concern. Mutagenesis has been tested at the University in Berkeley and the process is known as the Ames test. This test allows for the testing of mutations on DNA in substances such in chemicals and food substances. The National laboratory of protein engineering and plant genetics in Beijing carried out a similar test in GMO tomatoes and corn and found that GMO caused no mutations, this sample included 1200 plant species. “Two examples are frequently quoted regarding GM crop allergenicity: A project to develop genetically modified peas by adding a protein from beans that conferred resistance to weevils was abandoned after it was shown that the GM peas caused a lung allergy in mice” (Bawa & Anilakumar, 2013).

Soya bean engineered to express a Brazil nut protein was withdrawn from production after it was also found to be allergenic in tests. Opponents of GM technology often cite these examples as proof that it is inherently unpredictable and dangerous, although another interpretation would be to say that safety testing of GM plants was effective in both cases, having identified allergenic potential before either product was released to market” (Bawa & Anilakumar, 2013).

2.10 The role of the Consumer protection act and food packaging in South Africa

The purpose of consumer protection act (CPA) is to prevent exploitation to consumers by regulation of the market. The CPA prohibits misleading trade descriptions, which includes any statement made in an advertisement, label or packaging, or any display of a supplier which describes the number, quantity, measure, weight or gauge of the goods advertised and/or referred to on the labels or packaging.

The labeling of food items must meet certain legal requirements such as the name, a description of the contents of the product. Labels serve as information about the date and expiry of the food item. Labeling on food items should contain information about the net weight, volume and distinctive batch code. If food products have been genetically modified (GM) this must be indicated in the label (Consumer Protection Act South Africa, 2008). Information on pack in South Africa needs to be in English, must be clear and concise.

South Africa has had compulsory GM labelling regulations in place since 2004 when the Department of Health (DOH) introduced labelling regulations under the Foodstuffs, Cosmetics and Disinfectants Act (1972) – Regulation 25. The regulation states that “foodstuffs produced through genetic modification – where they differ significantly from existing foodstuffs in terms of their composition, nutritional value, mode of storage, preparation or cooking, allergenicity or genes with human or animal origin – must be labelled” (Department of Health South Africa, 2012).

All activities with GMOs in South Africa are regulated under the GMO Act. This includes research and development, import/export, production, consumption and other uses of GMOs and their products. The GMO Act establishes minimum standards to ensure the food/feed and environmental safety and socio-economic sustainability of all activities involving GMOs (Consumer Protection Act, 2008).

The Consumer Protection Act (CPA, 2008) Regulation 293 from the Department of Trade and Industry (DTI) states that ALL GM goods must be labelled.

According to the CPA regulations, food producers, importers and packagers currently have to choose one of three mandatory labels for GM foods: (i) “containing GMOs” where the GM content is at least 5%; (ii) “produced using genetic modification” for food produced directly from GMO sources; or (iii) “may contain GMOs” when argued that it is scientifically impractical and not feasible to test food for GM content. Voluntary labels include: (i) “does not contain GMOs” where the GM content is less than 1%; (ii) “GM content is less than 5%” where GM content is between 1% and 5%; and (iii) “may contain genetically modified ingredients” if it can’t be detected (Biosafety, 2017).

As the regulations stand, they would obligate the introduction of separate value chains and the testing of all possible GM-containing products, which will have considerable cost implications for the products on the market and the great majority of consumers who use them. For example, 87% of South Africa’s locally produced maize is currently GM. The direct cost increase to the consumer depends on many factors, but the average is calculated to be between 9% and 12%.

This implies that the majority of the market will bear the costs of maintaining a value-system-based choice of a minority (Department of Trade and Industry South Africa, 2008).

2.11 Summary

Genetic modification has had a significant role to play in South Africa and Africa because of food scarcity issues faced on the continent. Genetic modification is able to boost the crop yield because of its properties to become pesticide repellent. Through the years consumer behavior and perception of GMO has not always been favorable. Consumers in South Africa have become more aware and have started to seek out more frequently organic produce than in earlier years. This has led to an expansion in the organic market. This remains a relatively niche but highly profitable market if tapped. While many consumers believe that GMO has leading negative consequences for their health and many studies have been done to address the myths behind whether GMO is bad for the health or causes negative consequences, there is yet to be evidence to support this claim. Most of the articles reviewed were not able to substantiate a claim that GMO is negative, most test results proved that exposure to GMO showed no signs of negative effects. Manufacturers and retailers still do not adhere to the 5% GMO trace law that is passed on the Consumer Protection Act to label all food items accordingly. Consumers perceive GMO to be negative and might reject their purchase due to this feeling, however there is no evidence to suggest that South African consumers do this. From previous studies done in Europe, Italian consumers were found to be less likely to reject based on GMO than Danish, German and British consumers.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

In this chapter, the methodology utilized for the study will be reviewed. The purpose of this chapter is to explain how the study was conducted, the data collection and analysis used to test the research problem set out in Chapter one.

Included in this chapter are the selection of subjects, the data collection, the choice of the sample and population, sources of information, methods of data collection and methods of data analysis, interview design and administration of the interview. From the literature review the relationship between a consumer's awareness of genetic modification and understanding of the term has an effect on the purchasing habit or choice. An appropriate research methodology had to be chosen to show the effect of these variables. In this case the awareness level is the dependent variable on purchasing habit which is the independent variable. An appropriate methodology was chosen which will be discussed in this chapter to demonstrate this relationship between both variables in the study.

3.2 Research objectives

The aim of the study was to explore the awareness level of GMO within consumers who purchase packaged and fresh food. To determine whether the awareness level affected their consumption and purchase decisions. The study also covered what was their understanding of acronyms commonly found on food labels. The study also examined whether consumers shopping at Pavilion Mall are likely to switch to organic food products if they are aware of it and could afford it. Front and back of packaging labelling was an objective to the study to explore whether consumers read the packaging information and if they do, is it more likely the front or back of the packaging and are they basing purchase decisions on the information on content in the pack.

3.3 Research Design and Methods

The research design followed a coherent plan to make certain each of the research questions were answered by the objectives set out. The methodology for this study followed a quantitative approach.

The research strategy followed was a self-administered survey, which was sent to respondents via email to access online, respondents were also given an option for assistance to allow the researcher to capture their feedback on the behalf. The survey was carried out in English only, no vernacular language was made available, hence the need for the researcher to assist respondents to answer the survey. The survey contained a selection of 14 questions in total, which included demographic questions.

A pre-selection quota was applied before respondents were allowed in to the sample. The first question involved the frequency respondents claimed they shopped at Pavilion store if the respondent said not more than once in the last 3 months they fell out of the targeted sample. The next question was about the number of times maize, soy-beet and cotton products were consumed or bought in the last 3 weeks, if the respondent did not consume or buy any of the 3 products they were also not to be included in the sample. Respondents were asked whether English was their first language, as no vernacular language was possible for the survey. If the respondent did not answer yes to any of the pre-selection questions they were not included in the participation of the survey. The relevance of these pre-selection questions was to make certain that respondents selected would have consumed some form of GMO product in the last 3 weeks.

3.4 Research paradigm

Paradigms help to determine the questions researchers ask about constructs such as “race” and how they go about answering them. In the case of this study the investigation of the construct is about genetic modification. The methodology outlines what the research entails and gives a rough guide as to how the researcher intends on carrying out the research practically.

Positivists believe that there is a single reality, which can be measured and known, and therefore they are more likely to use quantitative methods to measure and this reality. The research paradigm for this study is an experimental research which uses a survey as the methodology to test (Creswell, 2003).

3.5 Study setting

The study setting was chosen according to the probability of a number of stores where consumers shop for fresh and frozen food. The Pavilion mall in Durban contains 4 such retailers, Woolworths, Checkers, Pick 'n Pay and Game. The mall is centrally located in Durban and most residents in Durban frequently shop at this mall.

3.6 Population and sample of the study

According to the institute of statistics, a population can be defined as a hypothetical set of objects that have similar characteristics and have an interest as a whole group for generalization (StatsSA, 2009). The sample frame that was used was the Pavilion mall with 4 stores that consumers were likely to buy a genetically modified food item from. The sample population was therefore limited to Durban only. A non -probability purposive sample that is nationally representative to South Africa demographics was drawn. Data from Census 2016 was used as a guide for the “natural fall out” of demographics.

3.7 Sampling method and sampling size

Non -probability sample was used with a purposive sample. With a store volume of Woolworths Pavilion- 15000 customers daily, Checkers Pavilion- 22000 customers daily, Pick n' Pay 22000 daily and GAME stores- 24000 customers daily, the total universe of customers daily for Pavilion mall was 83000 (Nielsen RMS, 2018). Using the 95% confidence level with 5% interval, a minimum sample of 384 was set to achieve sample from the 83000 consumers that visit Pavilion on a daily basis. An added 17% to the target was adhered to due to non-response and incompleteness, therefore the targeted sample was kept at 450 respondents. 104 completed surveys were achieved from the targeted 450 sample, the response rate for this survey was 23% (104 out of 450).

3.8 Survey Instrument

The instrument was constructed through adapting a developed questionnaire that is used by Millward Brown Research, the researcher also brainstormed other questions that were relevant to the research objectives and questions (Kantar Millward Brown, 2017). After a flow of questions was planned and put together, these questions were then built on to a survey web based system that allows respondents to take/ administer the survey on their own. The web based system that was used is called QuestionPro. This system was chosen over others because it did not have a limit on the number of questions that can be asked.

3.9 Pilot testing of survey

The survey was piloted among 5 consumers at Gateway mall. The researcher administered the survey during the pilot with the respondents and found that level of education has an effect on awareness of GMO, MSG and the ability to read and understand packaging information. This question was then included as part of the final survey. The pilot also aided to make certain that the script of survey online was accurate and the efficiency and timing of the survey needed to be known before the researcher sent out and administered the survey with the actual sample.

3.10 Data collection

The results were collected using two different approaches. The first approach was for the respondent to administer the survey by themselves and the survey was to be received either via email or through their smart device. Upon receiving the link to the survey via email, the respondent was given a maximum of 3 weeks to respond with the completed survey. During this period respondents who were emailed the survey were sent reminder mails to complete before the deadline.

The second approach was the respondent was assisted to capture the feedback through the researcher administering the survey while the respondent gave their feedback and continued their shopping at the mall. The surveys were administered between the 01 December till the 31 December 2017. The average time taken to complete the survey was 4 mins.

3.11 Data analysis:

The survey was closed on QuestionPro and data was collected and consolidated after a 3 week fieldwork period. The raw data was delivered in the form of a CSV file. The data was checked and cleaned of any errors. Most questions in the survey had Likert scale questions, mean scores, standard deviation data was generated through the raw excel. SPSS was used to analyze the data.

3.12 Reliability and validity of study

Validity in research refers to the level of quality of the data and integrity of it. Valid refers to being “plausible, credible, trustworthy and defensible” (Johnson & Christensen, 2000, p.207). In a study that involves nutrition and food interpretive and theoretical validity is important. The researcher when analyzing should be cautious that the understanding and perceptions of the respondents are accurately captured.

Reliability of data refers to the extent at which the measures are without bias. To attain “good” reliability measurement must be consistent across time and the items in the survey (Creswell, 2004). As a means to make certain that data quality was not compromised, as some surveys were administered by respondents, the researcher conducted call backs with respondents. These respondents were only those that completed the survey via email and self administered the survey. Respondents were selected from the list of email addresses that were recalled via QuestionPro software. This also assisted to the researcher to gain a sense of what the respondent felt about the types of questions, the length of the survey and whether they would be willing to participate in a future survey and to thank the respondent verbally.

3.13 Bias:

All research has potential limitations and it is important that the researcher acknowledge these. Some of the limitations are respondent bias and researcher bias.

Respondent Bias: The researcher emphasized that they should respond as honestly as possible. When participants feel threatened they tend to respond with what they think the researcher wants to hear. Before the self- administered survey begins, there was an opening statement that

read all information will be treated as confidential and please try to be as open and honest with feedback as possible, this reassured the respondent that there is no right and wrong answer.

Researcher Bias: As human beings, researchers cannot be completely neutral because they carry with them political, religious and racial attributes. Genetic modification is a hot topic that has been questioned from an ethical and business perspective. The researcher must be aware of the researcher bias and acknowledge that one cannot be value free. When capturing results the researcher must keep to facts and remain impartial to the feedback received from respondents.

3.13 Ethical considerations

Written permission was sought from the following individuals/ authorities.

- The University of Kwa-Zulu Natal's Ethics committee.
- The relevant retailers whom agreed at store manager level that it was appropriate to recruit consumers from their store while shopping.
- Participation in the study were anonymous and voluntary.

3.14 Summary

In this chapter the research design was chosen to explore awareness level among consumers toward genetic modification. The result will be used to ascertain whether their awareness level causes a positive or negative shift in behavior to purchase decisions. A nationally representative sample of the South African population was used to give a robust sample demographic. All questions were designed to be able to provide an understanding for all research questions and objectives.

CHAPTER FOUR: PRESENTATION OF RESULTS

4.1 Introduction

This chapter goes through the presentation of data which is in the form of descriptive statistics. The data will be presented using bar charts and pie graphs. The data was used to identify trends and the findings can be used to inform stakeholders such as manufacturers and retailers who have a responsibility to consumers to information on the products they buy for consumption. The results from this study is to be used for future in research where gaps and limitations from this research was identified. The flow of the chapter starts by introducing demographic data on each participant, next the data is presented showing questions that pertains to the objectives set out. The types of questions asked was both multiple choice with one answer possible and multiple mention possible. Most of the questions asked follow a Likert Scale type which are able to show ranked answers.

4.2 Demographic results

As mentioned in chapter three, pre- selection questions were asked to select respondents. Out of every 5 people approached in the Pavilion mall at least 3 claimed they shop at the mall at least once in the last 3 months and bought or consumed either a maize, soy-beet or cotton product. Most of the respondents approached said their first language was English. The demographics of the sample collected show some consumer insights that is congruent with shopping habits in South Africa, this will be discussed further in chapter five.

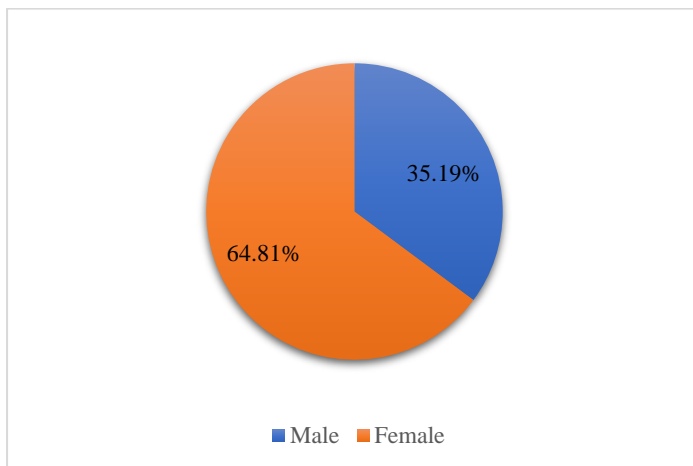


Figure 4.2.1. Gender of respondent in study

It was found that about two-thirds of the consumers were female $n=68$ (65%) and one third male $n=36$ (35%) (Figure 4.2.1).

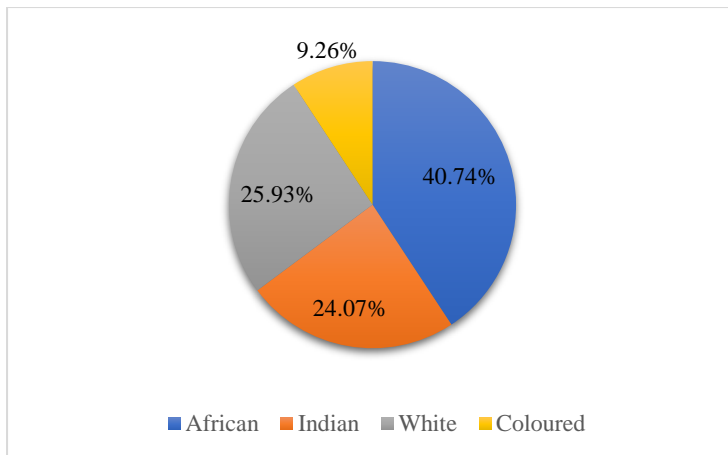


Figure 4.2.2. Race of respondent

Out of a total of 104 respondents, largely African n=42, good representation of the other three race groups.

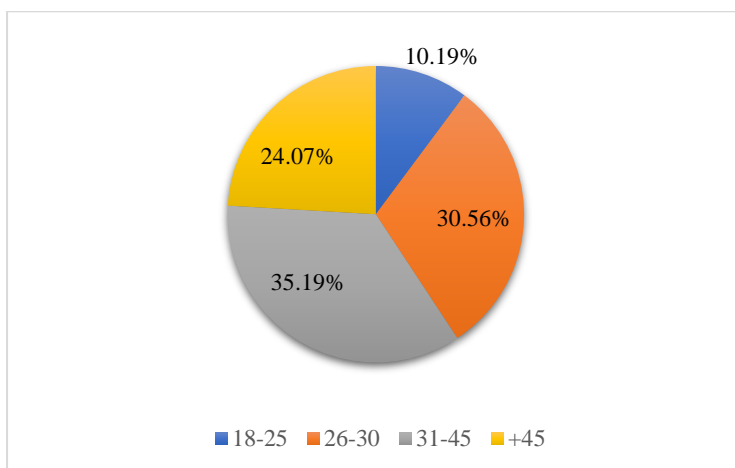


Figure 4.2.3. Age of respondent

Age of respondents were largely between 26 to 45 years old. Combined between these 2 groups made up 66% of the sample.

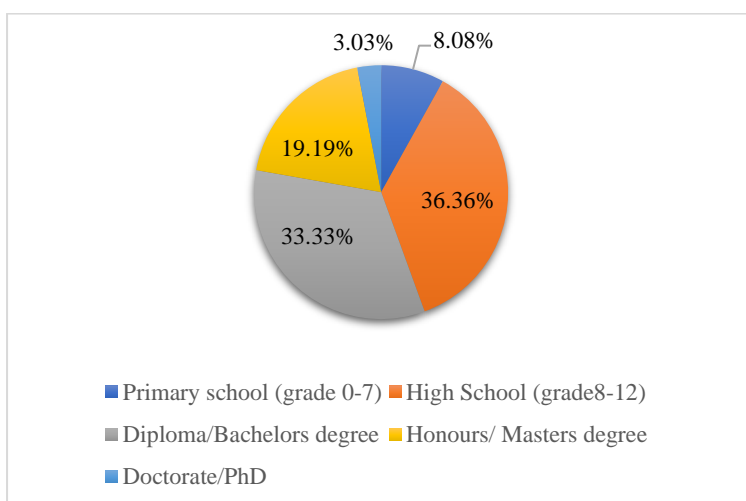
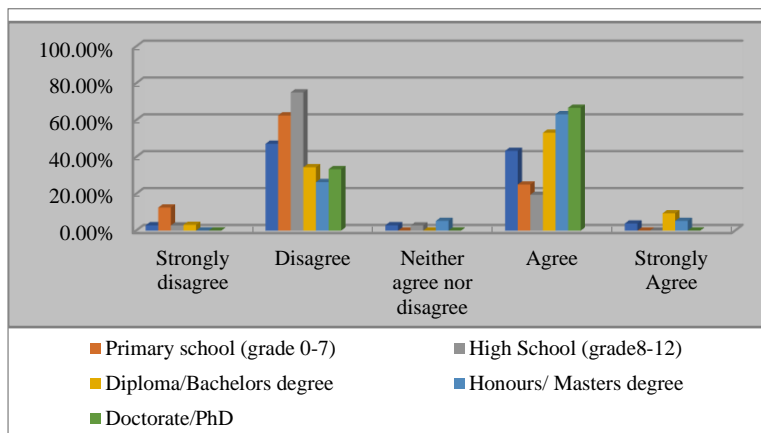


Figure 4.2.4. Highest level of education among respondents

The highest level of education between shoppers at Pavilion in sample is largely high school followed closely by a diploma/ bachelors degree.

4.2.5 Socio-demographic factors relating to awareness and purchase



Mean	3,10	2,63	2,53	3,41	3,53	3,00
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Figure 4.2.5.1. Reading the front and back of pack as guide to make decision, by education level.

The higher the level of education, the more likely to read the front and back of pack.

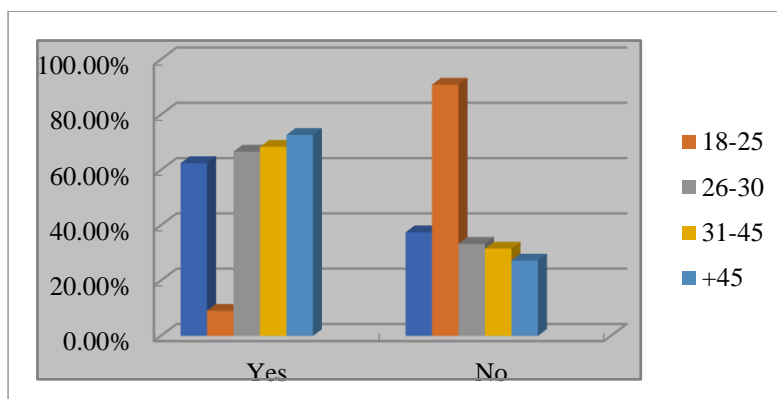


Figure 4.2.5.2. Awareness of GMO, by age.

Respondents between 45 years old and older are the most likely to be aware of GMO.

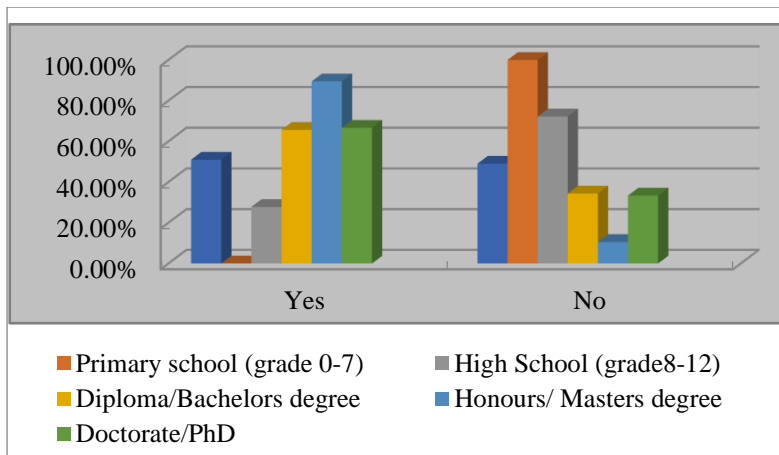


Figure 4.2.5.3. Understanding the meaning of GMO, by education.

Higher level of education translates to more likely to understand GMO meaning.

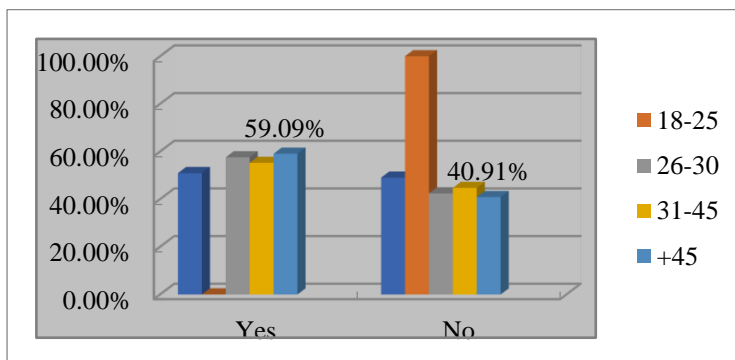


Figure 4.2.5.4. Understanding the meaning of GMO, by age.

Older respondents more likely to understand GMO.

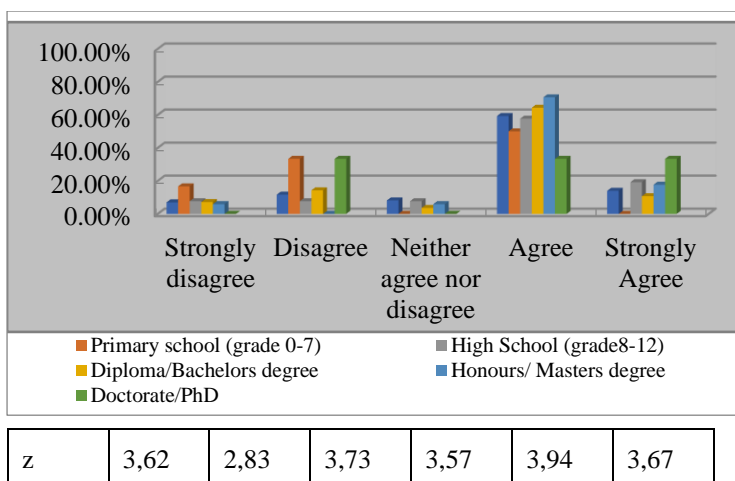
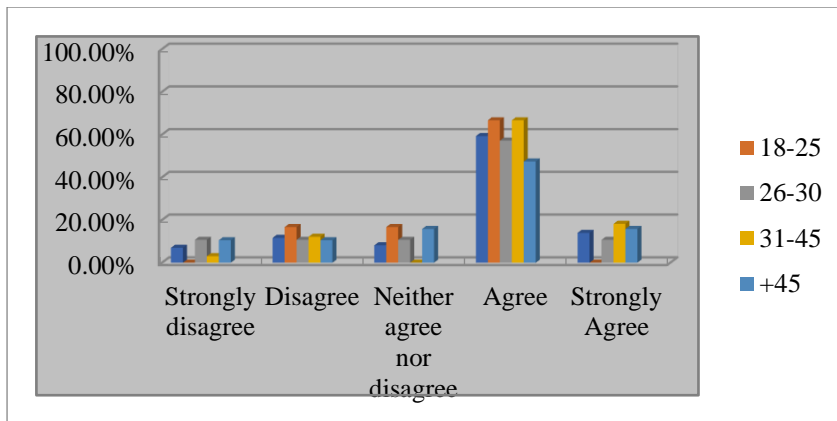


Figure 4.5.2.5. Aware of GMO, but still buys based on price, by education level.

Regardless of education, respondent still likely to buy based on price.



Mean	3,62	3,50	3,46	3,85	3,47
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Figure 4.5.2.6. Aware of GMO, but still buys based on price, by age.

Regardless of age group, all respondents buys on price.

4.3 Inferential statistics- Lifestyle and purchase decisions

The Likert scale is a rating scale that is used to evaluate the lifestyle choices made by respondents more frequently. The scale ranged from; 1 – Strongly disagree, 2 – Disagree, 3 – Agree, 4 – Strongly Agree. Mean scores above 2.5 means that the participant had a positive decision choice, and if the score was below 2.5 this meant that the result was skewed towards it being negative.

Table 4.3.1. Descriptive statistics of statements regarding lifestyle

<u>Lifestyle statement</u>	<u>Mean</u>
I am very strict about what I eat & drink	3,10
I shop for food items on price most of the time	4,04
I tend to stick to a balanced diet	3,43
I only ever feed my family healthy foods & beverages	3,75
Value for money is extremely important to me	4,18
I only ever buy food and beverages that are healthy	3,71
I tend to shop around for the best deal	4,15
My family's health is a key part of my life	4,13
Having fun is key to living a healthy life	4,16
Exercise is a very important part of my life	3,91
I choose brands of food and beverages depending on my mood	3,39
It's good to indulge in food or beverages every now and again	3,87
I always buy brands that my whole family enjoy	4,24
It's important to make time for yourself	4,10

I often treat myself	3,30
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Every results of statements asked is positive. This means that consumers are conscious about their health and wellness but they are also most likely to be shopping on price and value.

4.4 Labelling of packaging

<u>Statements regarding packaging</u>	<u>Mean</u>
I use the information from the front of the pack as a guide to understand the contents of the product.	2,98
I select products/brands based on price	3,84
Most of the time I do not bother about the packaging information, I purchase brands based on favourites/ what I trust	2,91
I read both front and back of pack that contains nutritional information	3,10

Consumers do see value in reading the front of pack to guide the value of what contents can be found. Consumers still buy and make choices on price. Habitual purchases are made based on delivery of brand or product on trust. Highly likely that consumers will read both the front and back of the pack for nutritional information.

4.5 Awareness and understanding of GMO and MSG

The next section of questions were used to check whether there appeared to be a relationship between being aware of GMO or MSG and what the level of understanding was for these terms.

4.5.1 Awareness and understanding of genetic modification

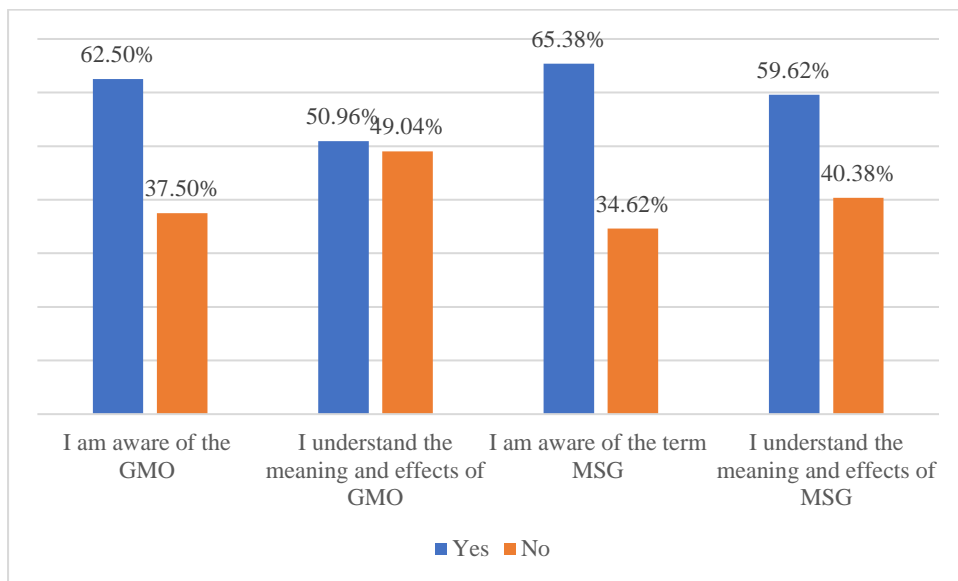


Figure 4.5.1.1. Total sample awareness and understanding of GMO and MSG

There is a high level of awareness for GMO and MSG, MSG has higher levels of awareness compared to GMO. There is a higher level of understanding of MSG rather than GMO. Only respondents that answered that they were aware of GMO were asked the following set of questions below on consumption. Answers were routed based on answering “yes” only.

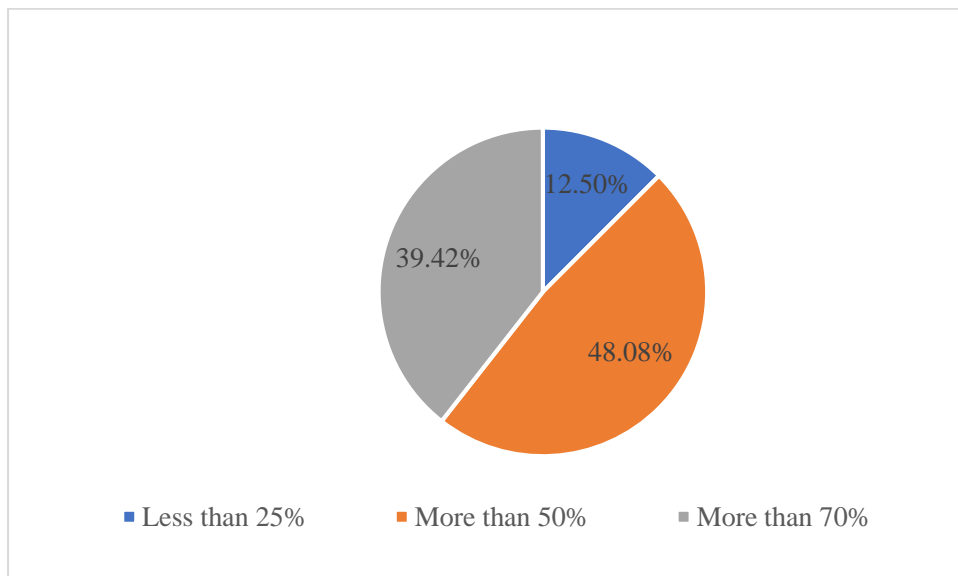


Figure 4.5.1.2 % of staple food that has been grown in SA that is modified

More than a third (39%) of the respondents answered correctly that more than 70% of food that is grown in South Africa has been grown through the use of genetic modification.

4.5.2 Consumption of GMO

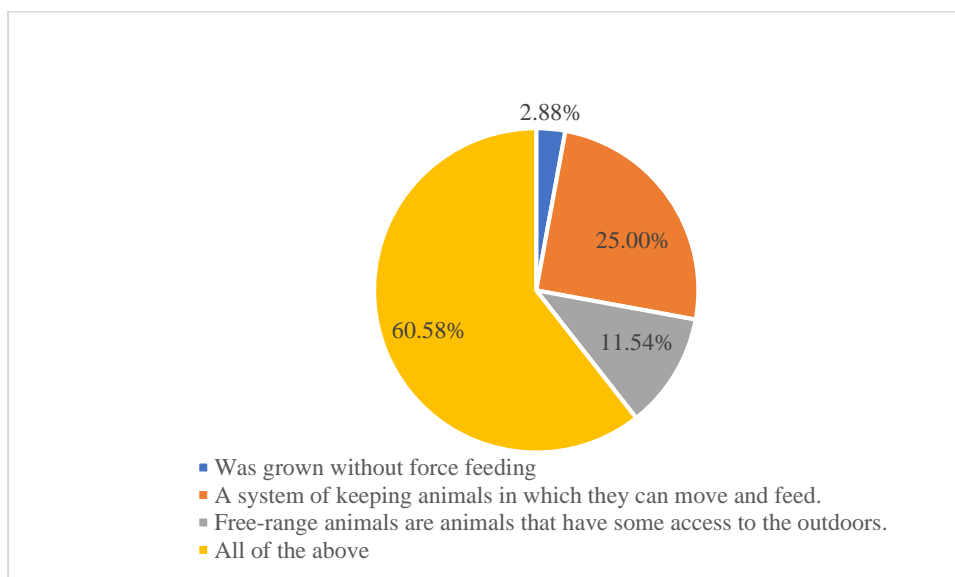
	<u>n</u>	<u>Mean</u>
If I consume products that contain traces of GMO is bad for my health	86	2,99
If an item contains the terms MSG, GMO, or "added sugar" I am less likely to buy that product	86	2,95
Pesticides and chemicals used in farming is negative on the agriculture and earth	86	3,58
I don't mind GMO or MSG I buy based on price	86	3,62

While consumers do perceive GMO to be negative for their health, they are not likely to change their purchase decision if they see the term GMO. Pesticides and chemicals used in farming are seen as negative to the earth and agriculture, but this too does not deter consumers as they feel that price is more likely to be a determinate at affecting choice.

4.6 Trend for organic food and a host of new buzz words on packaging

Recently, manufacturers have gained traction at introducing words on packaging on the way a product is farmed or grown. Not all consumers are likely to understand what is meant by these terms.

When respondents were posed this question only 61% of respondents answered correctly, which was all of the above.



4.6.1. Understanding the definition of free range

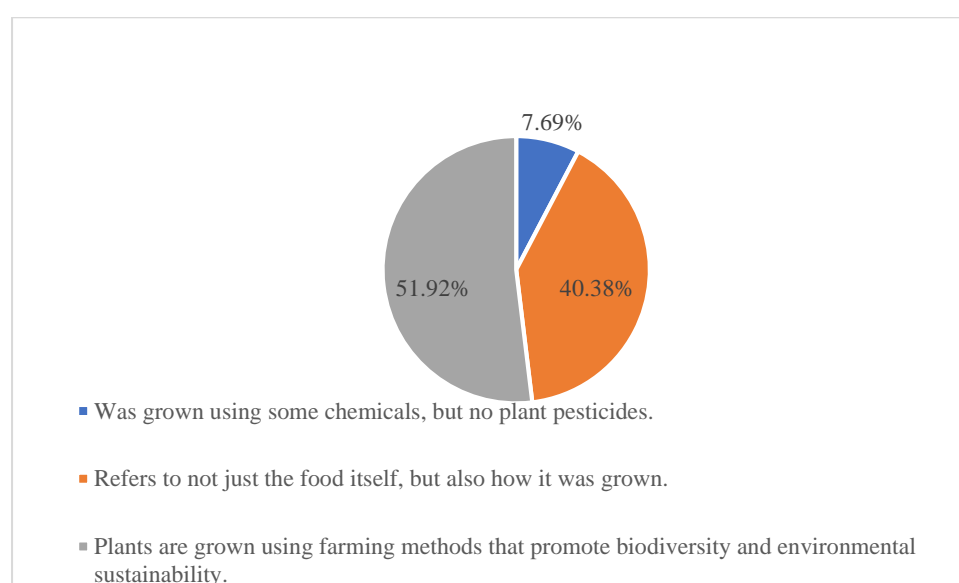


Figure 4.6.2. Understanding the definitions of organic

The definition of the term organic was received well with 52% of the sample getting that plants are grown using farming methods that promote biodiversity and environmental sustainability.

4.7. Understanding the consumer's need for organic food, is there a demand?

	<u>Mean</u>
I understand the term "organically grown" versus processed	2,99
I look for products that are grown organically	2,68
I am willing to spend more if something is produced organically	2,72
My basket is filled with more organic than conventionally produced/ processed/ genetically engineered food	2,57
I try to balance some food items being organic and some processed	2,76
I am willing to go to another store if I do not find food items that are grown organically	2,60
I am aware that there is biotechnology in agriculture to improve crop yields	3,18

Although the results are positively skewed, answers appeared to be polarized. While there may be consumers who are aware of organic and only buy organic, given the tough economic climate, consumers are still buying based on price. Organic food is generally more expensive. Consumers do not find it imperative to buy only where there is organic offered. A fewer number

in the sample are willing to go to another store to find organically grown, while majority of the sample are still buying based on price. While consumers are aware that biotechnology is involved in agricultural produce, there seems to be no negativity towards this.

South Africa has put out a white paper on organic food production for 2020 with a vision that 50% of all food produced must be produced through small holding farmers that fully comply to organic food production 9% of respondents in the sample said that they were not aware about this policy (National policy on Organic production, 2016).

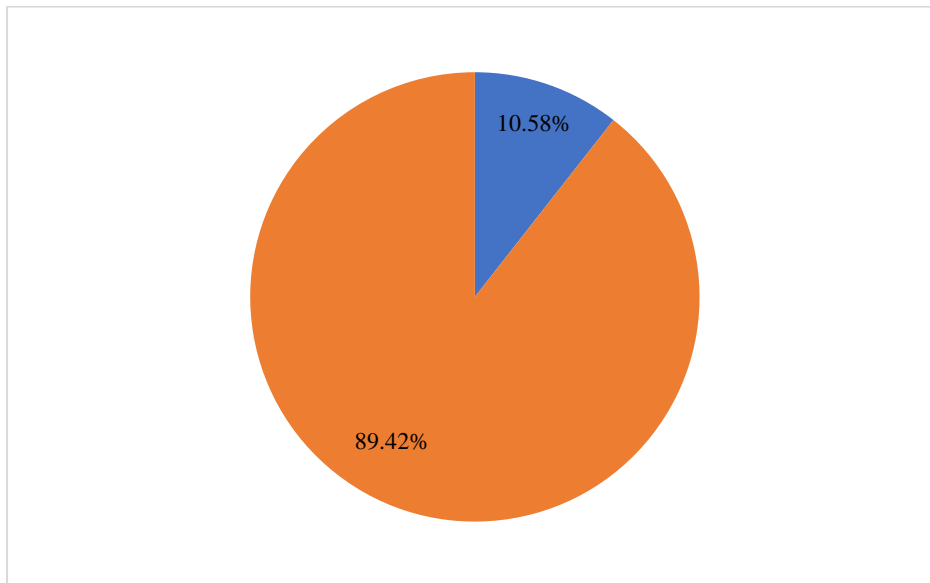


Figure 4.7.1 Awareness of the organic Food policy in South Africa

Retailers play a pivotal role in informing consumers and in the lifecycle of the consumer. While this study drew respondents that visited Pavilion, respondents were asked were do they usually/ frequently shop.

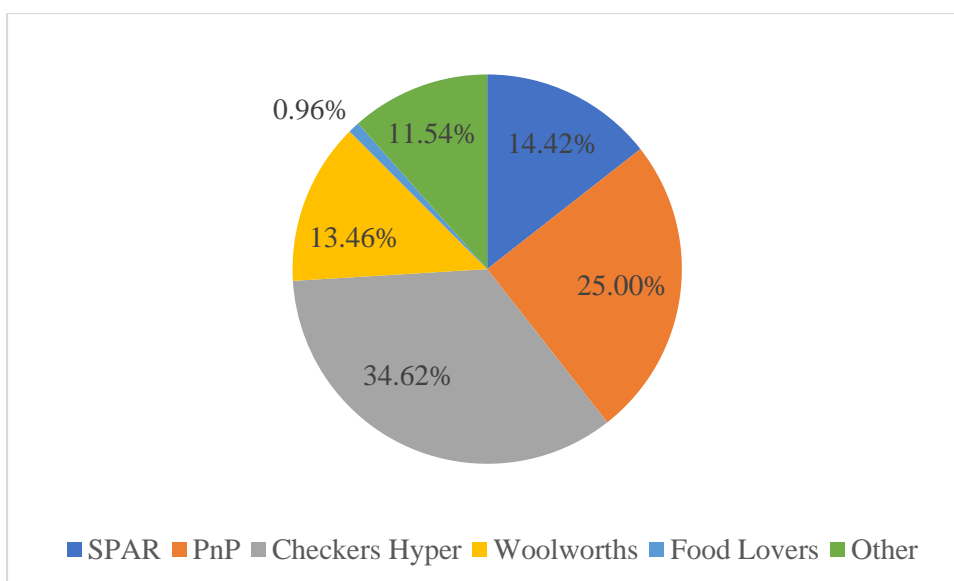


Figure 4.7.2. Frequency distribution of retailers

Checkers Hyper was the retailer that stood out, followed by PnP. Although Woolworths is the only retailer that actually carries more organic and non GMO products it is surprising to see that it still come out at 13%. This also feeds in to consumers looking for value and being price sensitive. Woolworths is skewed towards higher income households. Under “other”, Shoprite was the main retailer recalled by respondents.

4.8 Understanding the correlation between awareness and purchase of GMO products

Tests of Normality						
	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Knowledge on Labelling	.158	86	.000	.929	86	.000
Awareness of GMO	.343	86	.000	.702	86	.000
Knowledge on GMO	.190	86	.000	.935	86	.000
Practice	.371	86	.000	.779	86	.000
a. Lilliefors Significance Correction						

Figure 4.8.1. Table showing Kolmogorov-Smirnov and Shapiro Wilk tests.

The study found a significant positive relationship between Knowledge of labelling and practise(purchasing) ($r=0.276$, $p=0.013$). The study also found Knowledge on labelling negatively related to awareness of GMO ($r=-0.286$, $p=0.003$). it was also found that Awareness of GMO was negatively related to the purchasing behaviour ($r=-0.326$, $p=0.002$).

Table 4.8.2. Spearman's rank correlation test output

			Knowledge on Labelling	Awareness of GMO	Knowledge on GMO	Practice
Spearman's RHO	Knowledge on Labelling	Correlation Coefficient	1.000	-.286**	.090	.267*
		Sig. (2-tailed)	.	.003	.353	.013
		N	109	109	109	86
	Awareness of GMO	Correlation Coefficient	-.286**	1.000	.006	-.326**
		Sig. (2-tailed)	.003	.	.954	.002
		N	109	109	109	86
	Knowledge on GMO	Correlation Coefficient	.090	.006	1.000	-.111
		Sig. (2-tailed)	.353	.954	.	.311
		N	109	109	109	86
	Practice	Correlation Coefficient	.267*	-.326**	-.111	1.000
		Sig. (2-tailed)	.013	.002	.311	.
		N	86	86	86	86
**. Correlation is significant at the 0.01 level (2-tailed).						
*. Correlation is significant at the 0.05 level (2-tailed).						

The results showed that female consumers had higher mean rank for knowledge on labelling, and knowledge on GMP compared to the male counterpart (Table 4.8.3). But this was not significantly different from male ($p > 0.05$) (Table 4.8.4).

4.8.3 Comparing mean rank between male and female regarding attitude, awareness, knowledge and practices of GMO

Ranks				
Wilcoxon W	Gender	N	Mean Rank	Sum of Ranks
Knowledge on Labelling	Male	38	47.09	1789.50
	Female	70	58.52	4096.50
	Total	108		
Awareness of GMO	Male	38	59.36	2255.50
	Female	70	51.86	3630.50
	Total	108		
Knowledge on GMO	Male	38	55.30	2101.50
	Female	70	54.06	3784.50
	Total	108		
Practice	Male	28	41.20	1153.50
	Female	58	44.61	2587.50
	Total	86		

Gender of the participant did not have a significant impact on knowledge GMO and awareness of GMO and practise.

Test Statistics				
	Knowledge on Labelling	Awareness of GMO	Knowledge on GMO	Practice
Mann-Whitney U	1048.500	1145.500	1299.500	747.500
Wilcoxon W	1789.500	3630.500	3784.500	1153.500
Z	-1.843	-1.267	-.199	-.670
Asymp. Sig. (2-tailed)	.065	.205	.842	.503
a. Grouping Variable: Gender				

4.8.4 Table showing Kruskal-Wallis Test for race

Ranks			
	Race	N	Mean Rank
Knowledge on Labelling	African	44	44.91
	Indian	26	63.23
	White	28	63.96
	Coloured	10	47.50
	Total	108	
Awareness of GMO	African	44	63.56
	Indian	26	53.75
	White	28	37.77
	Coloured	10	63.45
	Total	108	
Knowledge on GMO	African	44	50.42
	Indian	26	60.88
	White	28	62.20
	Coloured	10	34.30
	Total	108	
Practice	African	33	42.00
	Indian	22	39.61
	White	27	49.07
	Coloured	4	39.63
	Total	86	

Test Statistics				
	Knowledge on Labelling	Awareness of GMO	Knowledge on GMO	Practice
Kruskal-Wallis H	9.531	14.244	7.919	2.663
df	3	3	3	3
Asymp. Sig.	.023	.003	.048	.447
a. Kruskal Wallis Test				
b. Grouping Variable: Race				

Race was significantly related to knowledge of labelling awareness and knowledge of GMO but practises was similar to knowledge on GMO. African (mean= 44.91) and Coloured (mean= 47.50) showed significant relationship to knowledge on labelling. Coloured showed the most significance to knowledge on GMO (mean= 34.30).

4.8.5. Table showing Kruskal-Wallis Test for age

Ranks			
	Age	N	Mean Rank
Knowledge on Labelling	18-25 years	11	43.18
	26-30 years	33	54.82
	31-45 years	38	59.92
	>45 years	26	50.96
	Total	108	
Awareness of GMO	18-25 years	11	85.55
	26-30 years	33	53.92
	31-45 years	38	52.41
	>45 years	26	45.15
	Total	108	
Knowledge on GMO	18-25 years	11	46.23
	26-30 years	33	55.95
	31-45 years	38	58.79
	>45 years	26	49.88
	Total	108	
Practice	18-25 years	6	37.92
	26-30 years	28	40.38
	31-45 years	33	48.80
	>45 years	19	40.66
	Total	86	

Test Statistics				
	Knowledge on Labelling	Awareness of GMO	Knowledge on GMO	Practice
Kruskal-Wallis H	3.014	15.157	2.182	3.145
DF	3	3	3	3
Asymp. Sig.	.389	.002	.535	.370
a. Kruskal Wallis Test				
b. Grouping Variable: Age				

Awareness of GMO was significantly different among different age groups of participants, but knowledge of labelling and purchase was similar. Education had significant impact on knowledge on labelling and awareness of GMO. Knowledge of labelling had a significant impact on 18-25 years old, awareness of GMO had a more significant impact on the +45 years old than any of the other age groups.

4.8.5. Table showing Kruskal-Wallis Test for education

Ranks			
	What is your highest level of education	N	Mean Rank
Knowledge on Labelling	Primary school	8	29.56
	High school	36	39.08
	Diploma or bachelor	33	57.02
	Honours or Masters	19	64.05
	Doctorate	3	69.33
	Total	99	
Awareness of GMO	Primary school	8	77.31
	High school	36	62.94
	Diploma or bachelor	33	40.79
	Honours or Masters	19	32.42
	Doctorate	3	34.50
	Total	99	
Knowledge on GMO	Primary school	8	54.00
	High school	36	45.85
	Diploma or bachelor	33	56.05
	Honours or Masters	19	48.11
	Doctorate	3	34.67
	Total	99	
Practice	Primary school	6	26.25
	High school	26	42.17
	Diploma or bachelor	28	38.71
	Honours or Masters	17	45.44
	Doctorate	3	43.17
	Total	80	

Education had a significant impact on the knowledge of labelling and awareness on GMO. Knowledge of GMO and practise are similar irrespective of level of education. The higher the level of education, the more likely the impact on awareness of GMO (mean= 34.50), knowledge of GMO (mean= 34.67) and practise (mean= 43.17).

Test Statistics				
	Knowledge on Labelling	Awareness of GMO	Knowledge on GMO	Practice
Kruskal-Wallis H	17.844	30.402	3.410	4.398
DF	4	4	4	4
Asymp. Sig.	.001	<0.01	.492	.355
a. Kruskal Wallis Test				
b. Grouping Variable: What is your highest level of education				

4.9 Summary

Majority of the sample demographic was Black, female between the age of 30 to 45 years old who had a minimum of high school education, which describes a large majority of consumers that make shopper decisions for their families on a regular basis. Consumers are concerned about health but may make trade offs based on income and spend. This may lead to down trading of brands during tough economic situations. While most consumers may strive to live a well balanced life, filled with exercise and having fun, they genuinely are also looking for bargains and pantry loading to deal with their tight spend. Consumers are likely to read the front and back of the packaging labelling, but the information gathered through these labels do not cause the consumer to change their decisions. The understanding of free range needs more work to be done on educating the consumer. Many retailers already carry this label and while consumers have seen the labels and possibly look for free range, there appears to be a gap in the understanding of the term (Chait, 2017).

While there is a fairly high level awareness of GMO and MSG, there appears to be also a fair understanding of what these terms actually mean. A small percentage of consumers were able to correctly answer what the percentage contribution of staple food made in South Africa contains GMO. Most respondents perceive GMO to be negative for their health but this perception does not translate to them looking for alternatives to purchase that are more healthy choices. Pesticides and other chemicals used is considered to be negative by respondents in the growth of plants and agriculture, but consumers are still not deterred to reconsider their purchase decision.

The South African market for organic food seems like it has not really taken off among the respondents in the sample. Perhaps this trend will start to pick up as the government plans to roll out the 2020 plan for 50% of all food produced to be organic. Checkers Hyper was chosen as most frequently shopped at, this retailer however, does not carry many organically produced items. This retailer caters to the middle income and lower echelon of the upper earners. This implies of the respondents in this sample, it is more likely that these consumers were not consciously shopping for non GMO food items.

CHAPTER FIVE: ANALYSIS OF DATA AND DISCUSSION

5.1 Introduction

The aim of this chapter is to translate the results from the previous chapter and to use the evidence from the literature review to compare and contrast results found through this study. Most of this chapter will cover an in-depth discussion of the results and ends with a summary of the discussion. The discussion will be able to draw meaningful conclusions from a South African context. The chapter focuses and continually go through the questions that were asked in the questionnaire, some questions will be analyzed together using cross tabulation with demographic data to enrich the analysis. The chapter will also be able to provide new information that is to be used in the following chapter for the summary and overall recommendations and conclusion. Any new subject knowledge that is derived from this research should be used to make key stakeholders aware and policy makers in South Africa that deal with food and nutrition policies to improve the quality of information available to the South African consumer. To start with the discussion, a recap of the objectives is relevant to draw meaningful trends and comparisons.

5.2 Awareness of genetically modified organism/ genetic modification toward purchase intent

While almost two thirds of the sample claim that they are aware of the terms GMO and MSG, awareness did not translate to understanding or wanting to question the meaning of these terms by respondents. Most of the respondents who were aware claimed that they did not understand the meaning of the terms. Respondents were more likely to have a negative perception of GMO and genetic modification, but were not really able to say why they feel it is negative or where have they heard or read about negative effects of this concept. A study in Turkey revealed a similar result to that of this study, while consumers are aware of GMO they do not have enough information about the process the crop follows (Tas et.al, 2015).

Of those respondents who claimed they were aware of the term GMO, the source of where and how the term was known was not questioned in the research, but we can infer that the media often plays a large role in order to communicate. Close to half of the sample also claim to read the pack information. We can also infer that some consumers may recall the term from pack information.

Awareness of GMO did not play a major role in governing the final purchase decision, only 46% of the sample said that they would not buy the product if packaging said “contains GMO”. In a study by Radam, 2010, respondents in the study perceived that if food products do not contain MSG or GMO it is perceived to be healthier for them. This is by contrast to South Africa and the responses received in this study.

While respondents are aware of GMO and there is a strong awareness that biotechnology is currently being used in South Africa to boost crop yields, about 73% of the sample still said that they do not mind that their food contains GMO, they still buy based on price.

Respondents agree that pesticides have a negative impact on agriculture and the earth, but this does not force them to choose products that have not been grown through no chemicals (Radam, 2010). Studies from UK, Sweden, and Norway reject genetic modification in totality, specifically rejecting the fact that there is gene technology used therefore their total brand or food experience is totally different to what South African consumers feel (Buiatti et al., 2013). A previous study in Norway that was conducted using empirical research whether consumers are likely to change their purchase decision if they are offered an incentive such as a discount for a product containing GMO (Grimsrud et al., 2002). The results showed that consumers are not likely to change their decision, their attitude toward GM caused a less likely willingness to accept, this was regardless of education and income earning (Grimsrud et al., 2002). This aspect is largely different in a South African context according to the results from this study.

Offering a discount or other incentive does not cause further persuasion to a European consumer, but as with this study, South African consumers prove to be more sensitive to offering a discount (Wunderlich, 2015). More than 73% of the sample claim that being offered a store discount will more likely cause the respondent to buy regardless of the fact that the food item contains genetic modification. As with other regions in the world where awareness and understanding for terms such as MSG, free range and organic were tested, South Africa proved to be below the curve in the understanding and acceptance (Radam, 2010). In addition to this a fairly large percentage of the sample tested were not able to correctly say what percentage of staple food has been made through use of genetic modification. South Africa policy makers

have a role to invest more in the education of what goes in to manufacturing food and the food processes. With the draft policy coming in to effect in the near future, this is a good time to make it transparent to all consumers in South Africa.

A cross tabulation was run on the total study for with highest level of education and age as top banners. Levels of awareness for GMO appear higher among groups that have bachelors or higher degrees. There also appears to be a higher level of understanding of genetic modification, MSG, free range and organic food (Radam, 2010). The higher the level of education among the consumers, the more likely that they are more likely to invest in organic food and fresh food that has not been processed. Exercising and having a more structured healthy way of living and eating is more apparent in the age group between 26-30 years old. It is clear in all age groupings and races that the whole sample was not adverse to pricing. Pricing remains a large contributor to the final decision. Belief that GMO has a negative effect on health was higher between those that are between 18-25 years old than any other age grouping, this very same age group also had the highest awareness levels in sample for awareness in biotechnology and pesticides used in farming.

Previous research reviewed, revealed through a sample of 2031 respondents across the United Kingdom and parts of Scandinavia and Europe that consumer attitude plays a large factor in the purchase decision. Italian consumers in particular had the most negative attitude toward genetic modification (Burton et al., 2001).

This study can be compared to these previous studies and shows a very different picture to views from European consumers. The results are similar in that South African consumers also reject genetic modification, they are aware of technology used in farming, but do not reject the technology and harmful processing used (Buiatti et al., 2013).

In addition to the differences in consumer belief systems to the previous research, it is apparent that the awareness toward modification and the negative perception, does not force consumers to either up-trade to organic food or a substitute, they make purchases based on brand trust and what is affordable. We can conclude that South African consumers are more likely to not question manufacturers on why they do not have more variety and options available that have not been mass grown that pose risk to the earth and agriculture. It seems like the culture in

purchasing is going with habitual purchases and gut feeling, what is likeable for the whole family.

5.2.1. Understanding how the awareness and knowledge of GMO correlates with socio-demographic variables.

While the gender results proved to skew more towards females (65%) and was not according to the national representation of South Africa which is 51% female. The shopping habits of consumers in South Africa proves is correlated with results, because females tend to be shoppers more frequently than males. There was an over indexing on Indian in the sample this could be due to the area where respondents were drawn. Regionally, larger number of Indians reside in Durban than anywhere else in South Africa, hence the base size of this race will appear higher in this province than anywhere else in South Africa, we cannot show a comparison to another province as this study was limited to Durban only (Statssa, 2017).

Millennials are defined as those between the ages of 18-34 years old and their shopping habits differ somewhat to the baby boomers and generation X (Fry, 2016). According to census, millennials will make up 33% of the population, in the case of this study, they made up 48% of the sample, this is significantly higher than the rest of South Africa, but not uncommon for a metropolitan area.

Very low understanding of GMO for age group between 18-25 years old. This is positively related to the low awareness levels for GMO. Media could have played a role in the awareness and understanding of this concept. Being aware and understanding the meaning of GMO was more commonly known to university graduates, however when it came to price, this was not a determining factor to purchase as all respondents in the study proved to be price sensitive regardless of their education level. Most respondents agreeing that regardless of being aware of GMO price still determines overall purchase. 26-30 year old are slightly less likely to be driven solely by price.

5.3. Attitude: Perceptions of the GMO and the trend toward organic food in South Africa

A study by Ghoochani, Ghanian & Baradaran, 2018, revealed that respondents perceive more benefits than risks for GM crops . The knowledge of the respondents regarding these crops had

positive impacts on perception of benefits. The results also revealed that those who are the most conscious about GM crops are more trusted. This study however showed that 53% of the respondents felt if they consumed GMO food it would lead to negative consequences on their health (Ghoochani et al., 2018)

As consumers seek out globally and more commonly in large metropolitan areas for more healthy food that does not harm the earth, this trend is not as apparent in the results of this study. By definition, organic food are both plants and livestock that are to reared using techniques and technology that effectively promote sustainability (UC Davis Agricultural Sustainability Institute, 2016). Over the last 10 years there has been a major trend toward using labelling such as “free range”, “organically grown” with consumers seeking out more fresh food rather than processed.

Little information and understanding exists for consumers, very few respondents in the study were able to correctly define what each term meant. A large majority of the sample, 66% did not seek out organic food as one of their primary shopping needs. Willingness to pay more for organically produced, was also not advocated through their responses. This is not for a lack of not being aware of organic food or knowing that biotechnology and current food being produced has gone through a process (Buiatti et al., 2013). While consumers are fairly aware that pesticides and other chemicals are used to boost crop yields, this does not force consumers to go to specific stores or make trade -offs in their baskets because food items contain organisms or “things that are bad for their health”. Organic in this context to these respondents were viewed as just the food or product itself, respondents didn’t view organic from a total farming and processing aspect.

Seeking out food that has been organically grown is most common among respondents in sample between the age group of 31 and 45 years old. This could be due to income level and this directly ties in to the level of education, the higher the level of education the more likely the respondent within this age group to seek out for more organically produced food items (Stats SA, 2017).

Woolworths and Food Lovers market are the most commonly called out retailers where organic food is available. While these retailers are common in higher income areas and are limited to developed, metropolitan areas, unfortunately Durban has not picked up on as yet the trend of organic fresh produce markets. Perhaps those consumers that seeking organic food do not want to go through the inconvenience of looking for stores and retailers that are selling organic. Consumers perception of food trends and the definition of food is somewhat different to Kwa Zulu-Natal, the mushrooming of organic food markets is due to the behavior change from food moving from sustenance to a fashion or trend or seen as a once off treat. This is trend differs to the United States and parts of Europe that have established multi- billion dollar companies such as WholeFoods (Wholefoods Market, 2018)

Perhaps, South Africa will pick up the pace toward this trend once the farming policy is in favor of 50% of food manufactured should be through organic and small holding farms that do not grow using pesticides and chemicals (National policy on Organic production, 2016).

5.3. Behavior: Understanding whether labelling on pack stimulates a purchase.

While South Africa has had made compulsory labelling to all food items that contain 5% or more of genetic modified material in food, this study revealed that having the GMO/GM labelling did not deter the consumer's purchase. According to a study by Venter 2010, South African consumers prefer packaging that has more concise wording that is simple and looks "clean", this study proved that even without fully understanding what the label says, consumers did not feel that this was a reason not to purchase (Venter, 2010).

We can infer that South African consumers have almost been sensitized to feel that even though they feel something is bad or has negative consequences for their health, they are not questioning retailers or manufacturers. There is a moral code as part of the consumer protection act that states that manufacturers are obligated to adhere and make certain to manufacture food that is not harmful to a consumer and make information available that states if there could be negative side effects from consumption (Consumer Protection Act, 2008). Unfortunately this study was not able to question consumers on whether they feel some of the food they eat has ever caused illness and what is their perception of GMO to their health. The question was asked as a closed ended question, but did not cover the feelings and where the negativity sparked from.

Consumers were more likely to buy if they were offered a price discount regardless of the packaging stating that GMO was present. Results to packaging on a total level for this sample was somewhat polarized. Only 4% of the sample said that they use the front of pack information as guide to the contents of the product composition. When probed about packaged information and brands or products that are bought out of loyalty as habitual purchases, 49% said that they disagree to this statement. This means that consumers are less likely to stay loyal based on reading pack information, there are other factors that govern their final purchases decisions and from the results in this study it is clear that price is still a large motivating factor. Reading the front of pack was found to be more important for the age grouping between 31 to 45 years old rather the 26 to 30 years old. Health and lifestyle style choice correlating to trade off's between buying on price versus what is good for my health is clearly seen in the data, the 31 to 45 year old age grouping tends to prefer what is good for my health versus what I enjoy eating. Respondents between the ages of 26 to 45 years old with education above high school is more likely to read both the front and back of the packaging. While the 26 to 30 year respondent would buy if offered a price discount, the 31 to 45 year old grouping would buy based on what is good for their health and diet and that would not harm their families health. A cross tab was run for the retailers that respondents bought from most frequently. The respondents that were more likely to read the labelling were those shopping retailers that were either Pick 'n Pay or Woolworths. Buying based on brands and trust, without the labelling or pack information was more likely to be in the younger age group of the sample than the older.

It is the moral responsibility of all food producers to adhere and honestly stipulate all information on labels both on front and back of pack on the content, side effects and negative health consequences for the long term that pertains to a consumer's well- being (Scott-Thomas, 2013).

5.7 Summary

Results of this research showed that while South African consumers in the Durban area are aware of genetic modification and there still appears that this awareness is associated to be negative for health, this does not deter the purchase and consumption of food. Very little media and education by the government to eradicate this negative perception. This study was not able to deduce when and how this negative perception began among consumers.

Labelling in food and other items that are found in grocery stores that are purchased by consumers, still remains a concern. Most of what is purchased is not always labelled correctly. Respondents in the study prove that they do read labels and are concerned about the content of what they eat. A recommendation is for retailers, manufacturers and the food governing societies and bodies in South Africa enforce that are food that is sold carry all information necessary for consumers to be well aware but also provide an understanding of what the jargon and scientific terms mean as well as what the effects to their health might be.

Organic food trend is more common in households with higher incomes, specifically with age group between 31 and 45 year old consumers. As the shift toward health and lifestyle choices change with growing older and income expands, consumers shift their purchases toward organically produced food. The trend is not so apparent among the younger ages in the sample of this study, there also appears to be a correlation with the higher educated consumers being more likely to seek organic food that those that lack the education and information behind why “free range”, “grass fed” and organically grown is better for their health. A recommendation to assist would be for policy makers to create a certification system for manufacturers to comply and adhere to or else face fining if minimum standards for labelling and information availability. The next set of questions were multiple choice with the correct answer added to the list.

Free range is not a new term, but is more often that not found on fresh and frozen vegetable and meat products, The definition of free range is that livestock was grown without force feeding, through a system of keeping animals in which they can move and feed and allowing these animals access to the outdoors .

The last chapter, gives an overall view of whether the objectives and questions to be answered set out in chapter 1 have been answered and were able to give recommendations and further builds for studies in the future.

CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

This study outlined the exploration of consumer awareness towards genetic modification of food products. Chapter 1 framed the research objectives and research questions to be answered in the study. Chapter 2, compared and contrasted different studies that were carried out in the United Kingdom, parts of Europe and Scandinavia, this chapter informed the gaps in current research and allowed the researcher to derive questions to be answered in a South African consumer's context. Chapter 3 covered the methodology, sample demographic and construction of the instrument. Chapter 4 was the presentation of the data and picking up trends in the information. Chapter 5 covered the discussion of the study, what were the key learnings and what actions can be set, which stakeholders are key and building on the implications for the rights of the consumers when purchasing on consuming food that is both good for them and not harmful to the earth. This final chapter in the summary of the study.

6.2 Conclusion

The study revealed, that while most consumers are aware of the terms GMO and MSG (which is not always commonly found on packaging and labelling of food items), consumers are not likely to change their decision on the food and brands they choose. While there are most consumers who are price sensitive and prefer to buy what they can afford regardless of what are the health consequences, South Africa as a community has not yet evolved to consuming food to sustain their longevity and that is not harmful to the planet.

While there is a high level of awareness of GMO, at 65% of the sample, only 50% claimed they understand the effects of GMO on their health and the environment. 48% of respondents felt that food that contained GMO was bad for their health. This negative perception does not deter the purchasing decision. Consumers are still making choices based on price and those that are no harmful to their families' health. Only 39% of the sample were able to correctly say what they think the percentage of food that is produced in South Africa is genetically modified. Almost half of the sample of respondents said that they do read the labelling and packaging information, however 74% of the sample said that they shop based on price. While South African consumers are reading the packaging information supplied this is not the determining factor in making their purchasing decision. About half the sample are aware and have bought

organically produced food, but the culture to be in search of organic food produce is not a large trend in the market.

6.3 Implications of this Research

It is the duty of the government and society to create a culture that consumers become more aware that they have a right to all information on pack about the foods consumed. The consumer protection act needs to become more vocal and become more stringent on food producers to make consumers aware if the contents of food contains any traces of genetically modified organisms. Consumers perhaps need more education on how food is currently grown and farmed. From this research it is evident that consumers are not really sure. The new draft policy on organic agriculture needs to be known to every single individual in South Africa.

6.4 Limitations of the Study

Administering of the questionnaire was a somewhat long process with the researcher explaining and capturing answers while the respondent was shopping. The survey could have been self-administered using a vernacular language as most respondents first language was not English. The scope of the topic was applicable to all South Africans, but this study focused specifically on consumers in Durban in the Pavilion shopping centre. For future studies this study can be used as a comparative study. One of the key questions that was not asked in the demographics section of the questionnaire was the number of people living in the household. This question would have been beneficial to make analysis for households that are buying based on affordability due to the number of people in the household.

6.5 Recommendations to solve the research problem

This study mainly focused on closed ended questions, but will prove to be useful insight to food manufacturers. Food and retailers are constantly looking for consumer insights to make better decisions for their business. In order to solve the problem of negative perception toward GMO as this study identified, there requires a joint effort by the South African government to either incentivise the education of consumers through the schooling system, through media that is paid by food manufacturers and retailers and for consumers to be able to have a platform to ask questions and be given advice. Doing this would assist in changing the perceptions and would give consumers a voice to be heard.

6.6 Recommendations for Future Studies

Building on this study to include open ended questions will be beneficial to better understand the feelings and attitudes of consumers when they see packaging that contains GMO versus one that does not. This could be done through focus groups and using a more diverse geographical range of communities to give a more wholistic view for South Africa.

6.7 Summary

Consumer awareness toward GMO, MSG and free range does not always translate in to a purchase. While there is a growing trend toward organic food, this trend has not yet reached the South African consumer. Consumers are still shopping around looking for the best deals in the current economic context. This sometimes means downgrading a purchase that they know is not necessarily good for their health but it is what is affordable to them. With a draft policy on organic food becoming 50% of the food produced and consumed by 2025, South Africa needs to invest more in the education on why organic food production is better on the environment and how organic food differs to genetically modified food. Through this study it is evident that consumers have heard of and are aware of genetic modification, they generally feel it means something bad or is bad for their health, but little information is known about how this perception came about. In order to move consumers forward in making more informed decisions, the explanation and education of both the positive and negative needs to be made clear to everyone before they choose to consumer any type of food or product that could potentially cause a risk to their health.

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Appendix A. Ethical Clearance

Appendix B. Survey

Pre selection question:

- How often do you shop at Pavilion shopping mall? (If respondent does not shop more than once in the last 3 months do not select respondent)
- Have you bought or consumed either maize, soy-beet, or a cotton product in the last 3 weeks? (If respondent has not bought or consumed any one of these products do not select respondent)
- Is English your first language? (Do not select the respondent if answer is no)

Demographics

Gender	Male
	Female
	Refused to answer
Race	African
	Indian
	White
	Coloured
	Refused to answer
Age	18-25
	26-30
	31-45
	+45
	Refused to answer
Highest level of education	Primary school (grade 0-7)
	High School (grade8-12)
	Diploma/Bachelors degree
	Honours/ Masters degree
	Doctorate/PhD

1. The following statements below are based on your lifestyle choices. Please read through statements below and answer as honestly as you can, there is no right or wrong answer

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
I am very strict about what I eat & drink					
I shop for food items on price most of the time					
I tend to stick to a balanced diet					
I only ever feed my family healthy foods & beverages					
Value for money is extremely important to me					
I only ever buy food and beverages that are healthy					
I tend to shop around for the best deal					
My family's health is a key part of my life					
Having fun is key to living a healthy life					
Exercise is a very important part of my life					
I choose brands of food and beverages depending on my mood					
It's good to indulge in food or beverages every now and again					
I always buy brands that my whole family enjoy					
It's important to make time for yourself					
I often treat myself					

2.The following set of questions deals with labelling on pack of food items bought and consumed. Please read through statements below and answer as honestly as you can, there is no right or wrong answer

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
I use the information from the front of the pack as a guide to understand the contents of the product.					
I select products/brands based on price					
Most of the time I do not bother about the packaging information, I purchase brands based on favourites/ what I trust					
I read both front and back of pack that contains nutritional information					

3.The following set of questions deals with scientific terms contained on food packaging. Please read through statements below and answer as honestly as you can, there is no right or wrong answer

	Yes	No
I am aware of the term GMO		
I understand the meaning and effects of GMO		
I am aware of the term MSG		
I understand the meaning and effects of MSG		

4. What do you understand by the term organic? (Multiple Choice, one answer possible)

Was grown using some chemicals, but no plant pesticides.

- Refers to not just the food itself, but also how it was grown.
- Plants are grown using farming methods that promote biodiversity and environmental sustainability.

5. What do you think is the definition of free range? (Multiple Choice, one answer possible)

- Was grown without force feeding
- A system of keeping animals in which they can move and feed.
- Free-range animals are animals that have some access to the outdoors.
- All of the above

6.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
If I consume products that contain traces of GMO is bad for my health					
If an item contains the terms MSG, GMO, or "added sugar" I am less likely to buy that product					
If I receive a discount to purchase I would more likely buy regardless of GMO					
Pesticides and chemicals used in farming is negative on the agriculture and earth					
I don't mind GMO or MSG I buy based on price					

7. This section deals with farming techniques and technologies. Please read through statements below and answer as honestly as you can, there is no right or wrong answer

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
I understand the term "organically grown" versus processed					
I look for products that are grown organically					

I am willing to spend more if something is produced organically					
My basket is filled with more organic than conventionally produced/ processed/ genetically engineered food					
I try to balance some food items being organic and some processed					
I am willing to go to another store if I do not find food items that are grown organically					
I am aware that there is biotechnology in agriculture to improve crop yields					

8. What percentage of staple food items are currently grown through genetic modification?
(Multiple choice, one answer possible)

- Less than 25%
- More than 50%
- More than 70%

9. Are you aware that South Africa has a draft policy on organic food production with smallholder farm owners? Yes No

10. Which retailers do you currently shop at for fresh food items? (Multiple choice, one answer possible)

- SPAR
- PnP
- Checkers Hyper
- Woolworths
- Food Lovers
- Other (Please specify)

Appendix C: Informed Consent