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Full Length Research Paper

Detection of GMO in food products in South Africa: Implications of GMO labelling

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Genetically modified (GM) crops currently account for 29% of crop production worldwide. South Africa is currently the only country in Africa to commercially grow GM crops. Despite a lack of regulations to provide for food labelling that allows for consumer preference, many products carry negative or positive labels with regard to genetic modification. The aim of this study was to test different maize and soy products to determine the uptake of GM food into the human food chain as well as the validity of "non-GMO" (genetically modified organisms), "GMO free" or "organic" labels, on local as well as imported products. Of the 58 products selected and sampled randomly, 44 tested positive for the presence of GM. Furthermore, of the 20 products with a GM related label, 14 tested positive for GM. These results demonstrate the extent of GM in the human food chain in South Africa and highlight the need for effective regulations to protect consumers against misleading claims.

Key words: Genetically modified organisms (GMOs), genetic modification (GM), food, labelling.

INTRODUCTION

With the advent of modern biotechnology, specifically genetic engineering, it has become possible to transfer a specific gene, called a transgene, from one organism to another across or within species boundaries, through a process called gene transformation. Genetically engineered crops are referred to as GM (genetically modified), GMO (genetically modified organism) and GE (genetically engineered). Transgenic organisms able to replicate (seeds or living organisms) are referred to as LMOs (living modified organisms). Genetic engineering has the potential to produce improved varieties in terms of quality and yield traits, more quickly than traditional breeding (Uzogara, 2000; Sharma et al., 2002).

The first generation of GM crops currently available contain input-traits with agronomic benefits to farmers but no direct benefit for consumers. Second generation GM crops involve health and nutritional properties that will benefit consumers, while third generation crops are aimed at the production of "nutraceuticals" and pharmaceuticals (Smyth et al., 2002) . In 2004, GM crops accounted for 29% of global crop production (James, 2004). It is estimated globally that 56% of soybean, 28% of cotton, 19% of canola and 14% of maize is GM (James, 2004). Currently, two GM traits are found in commercial GM crops, namely herbicide tolerance (in 75% of GMOs) and insect resistance (in 25% of GMOs). The countries growing 99% of GM crops are the USA (growing 59% of global GM crops), Argentina (growing 20% of global GM crops), Canada (growing 6% of global GM crops), Brazil (growing 6% of global GM crops), China (growing 5% of global GM crops), Paraguay (growing 2% of global GM crops), India (growing 1% of global GM crops) and South Africa (growing 1% of global GM crops) (James, 2004).

South Africa is unique in terms of growing commercial GMOs on the African continent. The GMOs available in South Africa include insect resistant and herbicide tolerant maize, insect resistant and herbicide tolerant cotton and herbicide tolerant soybean (Department of Agriculture, 2005). It is estimated that biotech crops account for 24% of yellow maize, 10% of white maize,

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Table 1. Government departments and NGOs involved with disseminating information on GM foods to consumers in South Africa.

Government Department	Description	Website
Department of Health (DOH)	To achieve a caring and humane society in which all South Africans have access to affordable, good quality health care which includes food labelling	www.doh.gov.za
National Department of Agriculture (NDA)	Ensuring access to sufficient safe and nutritious food and to provide an integrated national management system in support of sustainable use of genetic resources for food and agriculture including the approval of GMOs through the Directorate Genetic Resources	www.nda.agric.za
Department of Science and Technology (DST)	The development of science and technology expressed through the enabling mechanism of the National System of Innovation, for communities, researchers, industry and government	www.dst.gov.za
Public Understanding of Biotechnology (PUB) (initiative of DST)	To promote a clear understanding of the potential of biotechnology and to ensure broad public awareness, dialogue and debate on its current and potential future applications, including Genetic Modification (GM)	www.pub.ac.za
NGO	**Description**	**Website**
African Centre for Biosafety (ACB)	Campaigns on the African Continent for GMOs to be subject to the most stringent biosafety measures and is committed to promoting the publication of the views and concerns of African civil society groups on the African continent and world wide on issues relating to biosafety and solidarity amongst these groups	www.biosafetyafrica.net
AfricaBio	A biotechnology association for the safe, ethical and responsible research, development and application of biotechnology and its products. The Association also serves as a forum for informed dialogue on biotechnological issues in Africa	www.africabio.com
Earthlife Africa (ELA)	A membership driven organization of environmental and social justice activists, founded to mobilize civil society around environmental issues in relation to people	www.earthlife-ct.org.za
GRAIN (Genetic Resources Action International)	An international NGO which promotes the sustainable management and use of agricultural biodiversity based on people's control over genetic resources and local knowledge	www.grain.org
National Consumer Forum Trust (NCF)	Dedicated to the protection and promotion of consumer rights and interests in South Africa	www.ncf.org.za
SAFeAGE (South African Freeze Alliance on Genetic Engineering)	Committed to ensuring an OUTRIGHT BAN is imposed on genetic engineering in food and farming to ensure sufficient assessment and understanding is gained for all the implications it may have for consumers, farmers and the environment	www.safeage.org

50% of soybean and 85% of cotton production in South Africa (James, 2004).

Despite GMOs being grown commercially in South Africa since 1997, there is very little consumer awareness – even with government and non-government organizations (NGOs) making information on GMOs available (Table 1). A Human Science Research Council (HSRC) client survey in 2004, found that 7 out of 10 respondents from a sample of 5639 who completed a questionnaire, had never heard of a definition for biotechnology (Rule and langa, 2005). In addition to this, it is evident from this and other surveys to determine consumer attitudes towards GM that consumers have mixed opinions of GM food (Kempen et al., 2003; AfricaBio, 2004; Rule and langa, 2005). In contrast to this, there is strong consumer opposition to GM foods in the European Union (EU) and Japan (Carter and Gruère, 2003).

In response to consumer pressure, many countries have introduced labelling regulations for GM foods (Table 2). Although GMO labelling does not have any bearing on the safety aspect of GMOs, it is used to give consumers a choice, between GM and non-GM, allowing them to balance concerns of morality and perceived risk (Ahmed, 2002). All GM food labelling uses predeter-mined thresholds, as it is not possible to ensure zero GM

Table 2. GM food labelling regulations and thresholds for different countries.

Country	Labelling	% Threshold	Scheme
Australia and New Zealand[1,2]	Mandatory	1.0%	GM
Brazil[2,3]	Mandatory	1.0%	GM
Canada[2,3,4,9]	Voluntary	5.0%	Non-GE or GE
China[2,5]	Mandatory	1.0%	GM
European Union[6]	Mandatory	0.9%	GM
Indonesia[2,5]	Mandatory	5.0%	GM
Israel[7]	Mandatory	0.9%	GM
Japan[2,3,7]	Mandatory	5.0%	GM
Philippines[2,5]	Voluntary	N/A	N/A
Russia[2,5]	Mandatory	0.9%	GM
Saudi Arabia[2,5,7]	Mandatory	1.0%	GM
South Korea[2,5,7]	Mandatory	3.0%	GM
Switzerland[5]	Mandatory	0.9%	GM
Taiwan[2,5,7]	Mandatory	5.0%	GM
Thailand[2,7]	Mandatory	5.0%	GM
USA[7,8]	Voluntary	N/A	N/A
		5.0%	Organic

[1]Food Standards Australia New Zealand (2005), [2]Foster et al. (2003), [3]Agrifood Awareness Australia (2004), [4]Health Canada (2003), [5]The Center for Food Safety (2005), [6]Europa (2004), [7]Global Knowledge Center on Crop Biotechnology (2005), [8]United States Department of Agriculture (2002) and [9]Canadian General Standards Board (2004).

in a product once GMOs are present in the production system (Bullock and Desquilbet, 2002). Positive labelling is used to indicate that a product contains GM in excess of a predetermined threshold and is labelled as “GM” while negative labelling is used to indicate that a product is “non-GM” when the GM content is below a specified tolerance level. Labelling can either be mandatory or voluntary. A problem with the use of threshold labelling is that different countries use different tolerance levels and apply terminology differently. For example, “GM free” and “non-GM” labels are used alternatively. Depending on the regulatory body, “GM free” can imply zero GM or below a predetermined threshold (Partridge and Murphy, 2004). The confusion persists with the use of “organic”. In the EU, “organic” implies zero GM while the USDA (United States Department of Agriculture) uses a 5% threshold for “organic” (Partridge and Murphy, 2004; United States Department of Agriculture, 2002).

Wagner and Walchli (2002) argue that labelling GM products not only provides consumers with choice, but also communicates the benefits of GM and encourages the diffusion of GM products. However, Carter and Gruère (2003) question whether mandatory labelling gives EU consumers a choice, since the understanding of retailers and processors of consumer perceptions, has lead to a total absence of “GM” food products. They argue rather that voluntary labelling provides consumers with a choice as long as their willingness to pay for non-GM products exceeds the price premium required for such products. It is assumed that the absence of GM labelling regulations and the high level of GM food production in the USA corresponds to widespread consumer acceptance of GM. However, in a 2003 survey it was found that 58% of USA consumers polled, believed that they had never eaten GM food (Pew Initiative on Food and Biotechnology, 2003). In another USA study it was found that 30% of respondents wished to avoid GMOs (Baker and Burnham, 2002). This makes the assumption of USA consumer acceptance of GM food questionable. Baker and Burnham (2002) suggest that mandatory labelling could provide consumers with a choice but note the possibility that this may raise concerns among consumers and thus stigmatize GM foods. They also note that mandatory food labelling would be opposed by biotechnology advocates in the food industry due to fears over consumer rejection (Uzogara, 2000). Despite fears on labelling perceptions, GM labelling could be a key step in consumer education if applied accurately with consideration of consumer understanding.

According to the regulations of the Foodstuffs, Cosmetics and Disinfectants Act in South Africa, GM labelling is mandatory for products that: differ significantly from the characteristic composition and nutritional value of the corresponding existing foodstuff; the mode of storage, preparation or cooking of such a foodstuff differs

Table 3. Selection of maize products, description and manufacturer.

Product Name	Description	Producer
Amazon Corn Flakes	Cereal	Woolworths (Nature's Food)
Corn Flakes[1]	Cereal	Bokomo Foods
Corn Flakes[2]	Cereal	Kellogg Company
Corn Flakes[3]	Cereal	Woolworths
Ace	Maize meal	Tiger Foods Brands
Blue Bird	Maize meal	Sasko
Impala	Maize meal	Premier Foods
Iwisa	Maize meal	Premier Foods
Knorr Pap Mix	Maize meal	Robertsons
Maize Meal	Maize meal	Woolworths
Plaas Pap	Maize meal	Nola
Pride	Maize meal	Pride Milling
Summer Cream	Maize meal	Premier Foods
White Maize Meal	Maize meal	Earth Products
White Mealie Meal	Maize meal	Nature's Choice
White Star	Maize meal	Sasko
Yellow Mealie Meal	Maize meal	Nature's Choice
Maizena Corn Flour	Maize starch	Roberstons
Sheridans Corn Flour	Maize starch	Retailer Brands
Corn Thins Original	Rice cakes	Real Foods
Plain Rice Cakes	Rice cakes	Woolworths
Golden Cloud	Self-raising flour	Tiger Foods Brands
Self-raising Flour	Self-raising flour	Woolworths
Snowflake	Self-raising flour	Premier Foods
Old El Paso Taco Kit	Taco shells	General Mills
Baby Corn	Vegetable maize	Woolworths
Organic Baby Corn	Vegetable maize	Woolworths
Sweet Corn	Vegetable maize	Woolworths

significantly from that of the corresponding existing foodstuff; contains an allergen; is derived from plant material containing animal nucleic acid(s) or protein(s) material containing animal nucleic acid(s) or protein(s) derived from a human or from a different taxonomic animal family (Department of Health, 2004). also possible to label GM foods with regard to improved or enhanced characteristics such as composition, nutritional value and reduced causation of allergens using the wording “genetically-enhanced foodstuff” or “genetically- improved foodstuff”. Thus no GM foods in South Africa currently qualify for mandatory labelling, as the transferred genes in GM foods are from microbes and not animals or humans, are not known allergens and do not confer improved or enhanced characteristics in terms of composition or nutritional value.

Although no provision is made for labelling that allows consumers the choice of preference between GM and non-GM foods in South Africa, many products can be found in retail and health outlets with “non-GM”, “GMO free”, “organic” and even “may be genetically modified” labels. Presumably the type of label being used is aimed at perceived consumer perception and preference, especially products marketed for vegetarians. However, since no regulations exist for GM labelling in South Africa, there is no system to verify such claims and consumers must take the labels at face value. The aim of this study was to test different maize and soy products to determine the uptake of GM food into the human food chain as well as the validity of “non-GMO”, “GMO free” or “organic” labels, on local as well as imported food products.

MATERIALS AND METHODS

A total of 58 food products representing a variety of processing steps for maize and soy were selected and sampled randomly from retail stores including Pick ‘n Pay, Shoprite Checkers, Spar and Woolworths as well as small retail outlets including health food shops according to product availability (Tables 3, 4 and 5).

DNA was extracted in duplicate from samples using the CTAB method and purified using DNA extraction kits which use RNAse digestion followed by chloroform extraction. The aqueous phase was further cleaned using micro-spin columns according to Anklam et al. (2002) . The extracted DNA was run on an agarose gel to assess DNA yield and quality. The extracted DNA was screened for the presence of the transgenic 35S CaMV sequence using sufficient amplification cycles to detect transgenic material with a limit of detection (LOD) of 0.01% according to the validated method of Lipp et al. (2001). Duplicate extraction samples, two buffer blank controls and two positive controls with known amounts of target sequence were subjected to PCR using an Applied Biosystems GeneAmp PCR System 9700. The PCR product was run on agarose gels, stained with ethidium bromide and visualized under UV light using the Gel Doc 1000 Image Analysis System (Biorad).

Gels were scored only if the positive and negative controls resulted in the presence and absence of the expected amplification product, respectively. Samples were only scored if replicate results were uniform. To minimize the risk of cross-contamination, individual steps were performed separately in terms of physical space and equipment. PCR inhibition was checked for each duplicate sample.

Table 4. Selection of soy products, description and manufacturer.

Product Name	Description	Producer
Soya Beans[1]	Soy beans	Health Connection Whole Foods
Soya Beans[2]	Soy beans	Nature's Choice
Soya Crisps	Soy crisps	Woolworths
Soya Flour	Soy flour	Health Connection Whole Foods
Dew Fresh Soya Milk	Soy milk	Dew Fresh Products
Nutribev	Soy milk	Hovennnuts
Simply Soy	Soy milk	SoyEx
Soy Milk	Soy milk	Good Hope
Soya Milk[1]	Soy milk	Pick 'n Pay
Soya Milk[2]	Soy milk	Woolworths
Soysense	Soy milk	Woolworths
"Cape Creamy"	Soy milk powder	Nature's Choice
Diabet-Mil	Soy milk powder	Cape Nutraceuticals
So Fresh	Soy milk powder	So Fresh International
Soya Milk Powder	Soy milk powder	Health Connection Whole Foods
SPP	Soy milk powder	Specialised Protein Products
Knorrox Soya Mince	Soy mince	Robertsons
Royco Vita Mince	Soy mince	Master Foods South Africa
Soya Chunks	Soy mince	Health Connection Whole Foods
Braai Flavour Sausages	Soy protein	Fry Group Foods
Chic Burger	Soy protein	Soyatech
Pure Vegetable Sausage	Soy protein	Sultan's
Spiced Burgers	Soy protein	Fry Group Foods
Spicy Soya Burger	Soy protein	Sun-C Foods
Vegee Viennas	Soy protein	Penniken Health Food Manufacturers
Vegetarian Chicken	Soy protein	Yuh-Der Industries
Vegetarian Schnitzel	Soy protein	Woolworths
Vegi Steak	Soy protein	Trident Foods
Soya Drinking Yoghurt	Soy yoghurt	Woolworths
Strawberry Yoghurt	Soy yoghurt	Fairfield Dairy

RESULTS AND DISCUSSION

Out of 58 off-the-shelf food products sampled randomly from different retail and health outlets, 76% tested positive for GM (Tables 6, 7 and 8). It must be noted that the sampling used did not take batch effects into account. For maize, GM was detected in 63% of local and 90% of soy products (Table 8). These results indicate that the current GM production in South Africa may be higher than the estimated 24% for yellow maize, 10% for white maize and 50% for soy bean (James, 2004). However, the South African Grain Laboratory determined that for 2003/2004, only 3% white maize and 2% yellow maize was found to contain GM (South African Grain Laboratory, 2005). This suggests that either there is a delay of GM entering the food chain possibly due to the

Table 5. Summary of products tested in terms of GM related label.

Product description	Negative label	Positive label	Total Products
Maize			
Cereal	1	1	4
Maize meal	1	1	13
Maize starch	0	1	2
Rice cakes	1	0	2
Self-raising flour	0	0	3
Taco shells	0	0	1
Vegetable maize	1	0	3
Total	**4**	**3**	**28**
Soy			
Soy beans	1	0	2
Soy crisps	0	0	1
Soy flour	1	0	1
Soy milk	2	0	7
Soy milk powder	4	0	5
Soy mince	1	0	3
Soy protein	4	0	9
Soy yoghurt	0	0	2
Total	**13**	**0**	**30**

Table 6. Detection of GM in unlabelled maize and soy food products.

Product	Description	Origin	GM Result
Maize Products			
Corn Flakes1	Cereal	South Africa	Negative
Corn Flakes2	Cereal	South Africa	Negative
Ace	Maize meal	South Africa	Positive
Blue Bird	Maize meal	South Africa	Positive
Impala	Maize meal	South Africa	Positive
Iwisa	Maize meal	South Africa	Positive
Knorr Pap Mix	Maize meal	South Africa	Positive
Plaas Pap	Maize meal	South Africa	Positive
Pride	Maize meal	South Africa	Positive
Summer Cream	Maize meal	South Africa	Positive
White Mealie Meal	Maize meal	South Africa	Positive
White Star	Maize meal	South Africa	Positive
Yellow Mealie Meal	Maize meal	South Africa	Positive
Maizena Corn Flour	Maize starch	South Africa	Negative
Sheridans Corn Flour	Maize starch	South Africa	Negative
Plain Rice Cakes	Rice cakes	South Africa	Negative

Table 6. contd.

Golden Cloud	Self-raising flour	South Africa	Negative
Snowflake	Self-raising flour	South Africa	Positive
Old El Paso Taco Kit	Taco shells	Australia	Positive
Baby Corn	Vegetable maize	South Africa	Negative
Sweet Corn	Vegetable maize	South Africa	Negative
Soy Products			
Soya Beans[2]	Soy beans	South Africa	Positive
Soya Crisps	Soy crisps	South Africa	Positive
Dew Fresh Soya Milk	Soy milk	South Africa	Positive
Nutribev	Soy milk	South Africa	Positive
Simply Soy	Soy milk	South Africa	Positive
Soya Milk[1]	Soy milk	South Africa	Positive
Soya Milk[2]	Soy milk	South Africa	Positive
So Fresh	Soy milk powder	South Africa	Positive
Knorrox Soya Mince	Soy mince	South Africa	Positive
Royco Vita Mince	Soy mince	South Africa	Positive
Pure Vegetable Sausage	Soy protein	South Africa	Positive
Spicy Soya Burger	Soy protein	South Africa	Positive
Vegee Viennas	Soy protein	South Africa	Positive
Vegetarian Chicken	Soy protein	South Africa	Positive
Vegetarian Schnitzel	Soy protein	South Africa	Positive
Soya Drinking Yoghurt	Soy yoghurt	South Africa	Positive
Strawberry Yoghurt	Soy yoghurt	South Africa	Positive

existence of reserves or that a diffusion of GM is occurring in non-GM product in the food chain during processing.

Of the products tested, 7 maize and 13 soy products carried a GM related label (Table 5) . GM was detected in 57% of labelled maize and 77% of labelled soy products (Table 8). Two out of the three maize products with a “may be genetically modified” label were found to contain GM (Table 7) . GM was also detected in 71% of all products with either a “non-GM”, “GMO free” and/or “organic” label. Of the products with a negative GM label, GM was present in 50% maize and 77% soy products (Table 8). Only three products carried information on the certification scheme or body that applied. It must be noted that the level of GM in products was not quantified in this study, thus it is possible that a product tested positive for GM but was below a certain threshold. These results suggest that consumers may misinterpret GM labels on food products, as the terms “GMO free”, “non-GM” and/or “organic” have not been defined in South Africa and differ from country to country. Thus it may be necessary for products with negative GM related labels to carry additional information to substantiate the claims being made as suggested by the Department of Health especially for the term “GMO free”, the use of which is not considered acceptable in South Africa (Department of Health, 2004).

The retail stores and producers, whose products were tested, were asked for comment on these results (Table 9). Of the companies that replied, most indicated that in the absence of specific guidelines for food labelling in South Africa, companies have to devise their own terms of reference. Thus it is evident from the responses that the terms “non-GM”, “GM free” and “organic” should be clarified in a South African context instead of the current ad hoc approach.

It appears that the vacuum in regulations for consumer preference in terms of non-GM food has also left a vacuum in the use of such labels. It is important to note that the presence of GM in a “non GM” or “organic” product does not necessarily indicate a contravention of the label but depends on the terms of use of the certifying

Table 7. Detection of GM in labelled food products.

Product	Description	GM / Organic claim	Certification Body	Origin	GM Result
Maize Products					
Amazon Corn Flakes	Cereal	Organic	QAI[1]	USA	Positive
Corn Flakes[3]	Cereal	May be genetically modified	-	South Africa	Negative
Maize Meal	Maize meal	May be genetically modified	-	South Africa	Positive
White Maize Meal	Maize meal	GMO free / Organic	-	South Africa	Positive
Self-raising Flour	Maize starch	May be genetically modified	-	South Africa	Positive
Corn Thins Original	Rice cakes	GMO free	-	Australia	Negative
Organic Baby Corn	Vegetable maize	Organic	ECOCERT	Zambia	Negative
Soy Products					
Soya Beans[1]	Soy beans	Not genetically modified	-	South Africa	Negative
Soya Flour	Soy flour	GMO free	-	South Africa	Negative
Soy Milk	Soy milk	non-GM	-	South Africa	Positive
Soysense	Soy milk	Organic	QAI[1]	USA	Positive
"Cape Creamy"	Soy milk powder	GM free	-	South Africa	Positive
Diabet-Mil	Soy milk powder	GMO free	-	South Africa	Positive
Soya Milk Powder	Soy milk powder	GMO free	-	South Africa	Positive
SPP	Soy milk powder	non-GM	-	South Africa	Negative
Soya Chunks	Soy mince	GMO free	-	South Africa	Positive
Braai Flavour Sausages	Soy protein	GMO free	-	South Africa	Positive
Chic Burger	Soy protein	GMO free		South Africa	Positive
Spiced Burgers	Soy protein	GMO free	-	South Africa	Positive
Vegi Steak	Soy protein	GMO free		South Africa	Positive

[1]Quality Assurance International.

scheme as previously explained. It is important to note that “GMO free” may not indicate zero GM. For example, in the USA, the Food and Drug Administration (FDA) define “free” in terms of very low minimum levels (Partridge and Murphy, 2004). Partridge and Murphy (2004) suggest that for “GM free” a threshold of 0.2% could be set. In terms of organic foods, the Joint FAO/WHO (Food and Agriculture Organization of the United Nations and World Health Organization) Food Standards Programme of the United Nations, *Codex Alimentarius*, has published guidelines for Organically Produced Foods (2001) wherein it is stated that GMOs “are not compatible with the principles of organic production (either the growing, manufacturing, or processing) and therefore are not accepted under these guidelines” (FAO/WHO, 2001). This implies a zero tolerance for GM in organic foods as opposed to a tolerance of 5% under USDA guidelines (United States Department of Agriculture, 2002). However, in the absence of a statutory definition in South Africa for “GMO free”, the common interpretation is zero GM. Thus it remains to be seen whether the international community will ever reach a consensus on GM food labelling.

There are additional considerations for the co-existence of GM and non-GM crops in terms of adventitious co-mingling. Adventitious co-mingling can result from pollen-mediated gene flow from GMOs to conventional plants unless specific precautions are taken to minimize volunteer GM plants and maintain isolation distances; at harvesting if equipment is not cleaned properly; as well as during storage, transport and packaging (Smyth and Pillips, 2002; Snow, 2002). Unless specific precautions are taken in the production chain, commingling is inevitable.

Although GM food is here to stay, consumer preference in South Africa has not really begun to assert itself considering current levels of consumer awareness. Thus an increased awareness of biotechnology in general will also increase consumer demand for choice between GM and non-GM. In order to offer consumers a choice, even if they are willing to pay extra for it, definite guidelines for the use of terminology and a system of verification to ensure consumer protection and prevent product misrepresentation will be required.

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Table 8. Summary of product testing with regard to maize and soy products, local and imported products, products with and without GM labels as well as products with negative and positive GM labels.

Total Products	**Number of Products**		**GM Detected**	
Maize	28		61%	
Soy	30		90%	
Total	58		76%	
Local Products	**Number of Products**		**GM Detected**	
Maize local	24		63%	
Soy local	29		90%	
Total	53		77%	
Imported Products	**Number of Products**		**GM Detected**	
Imported maize	4		50%	
Imported soy	1		100%	
Total	**5**		60%	
Product Labels	**No Label**	**GM Detected**	**Labelled**	**GM Detected**
Maize	21	62%	7	57%
Soy	17	100%	13	77%
Total	**38**	**79%**	**20**	**70%**
Label Type	**Negative GM Label**	**GM Detected**	**Positive GM Label**	**GM Detected**
Maize	4	50%	3	67%
Soy	13	77%	0	NA
Total	17	71%	**3**	67%

Table 9. Response from South African retail stores and producers of products with GM related labels to the results of off-the shelf testing of food products.

Company	**Policy on GM food labelling**	**System to vallidate labels**	**Comment**
Retail Stores			
Pick 'n Pay	To ensure compliance with legislation	Respond to complaints about misleading or illegal labelling and encourage suppliers to make the necessary changes	The use of "GMO free" is considered misleading due to possible adventitious contamination in products. In the absence of guidelines for voluntary non-GM labelling it is difficult to provide consumers with accurate and meaningful information on the GM status of all products
Woolworths	To "remove , replace or label" ingredients from GM crops in foods	1) Require independent certification of organic products by suppliers, 2) Require IP and PCR verification for ingredients from potential GM crops	Consumers require and are entitled to sufficient and accurate food label information to make informed purchasing decisions
Producers			
Earth Products	Produce non-GM product	Rely on supplier affidavits	Have instituted the verification of non-GM product through independent testing
Fry Group Foods	Produce non-GM product	Use suppliers with in-house certification and testing	In the absence of South African guidelines the suppliers certify products according to European Union standards for non-GM product (below 0.9%)
Good Hope International Beverages	Produce non-GM product	Rely on supplier integrity	Have instituted the verification of non-GM product through independent testing
Nature's Choice	To label "GMO free" products	Rely on supplier integrity	There is need of a national regulatory authority. Are concerned about the spread of GMO foods in the food chain

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