

# A Review on Perception of Genetically Modified Foods in Nigeria

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## Abstract

Genetically modified foods (GMFs), GMOs or engineered foods refer to foods produced from genetically modified plants or animals, whose DNA have undergone modifications either by an inherent or a foreign DNA (transgenes) for improvement of the targeted organism. Genetically modified foods were introduced to Nigeria by National Biotechnology Development Agency (NBDA) to combat food security issues and other agricultural challenges. After the introduction, the Nigerian Government believed that the products can be released to the market. This brought persistent arguments by Nigerians on the perception and acceptance of the GM foods. The basis for the arguments were made on factors such as safety, environmental threat, price, means of colonization, food security, family size, potentiality, income, awareness of GM foods. These arguments were by individuals and organizations within various areas/fields in Nigeria. The perception led to the division of Nigerians to protagonists and antagonists with regards to GMOs. The article reviewed the introduction, perception s and views of factors on GMFs acceptance among Nigerians.

**Keywords:** Acceptance, Factors, GMFs, Nigerian, Perception

## INTRODUCTION

Nigeria is one of the highly occupied nations in Africa with about 180 millions of people, which depend on farming and foreign exchange of crops like cocoa, kola, groundnut as source of revenue, before the oil discovery. Kano was popularly known for groundnut production (*Dalar Gyada*) where groundnuts are in abundance for sales and consumption. Due to sudden decline in farming; the country diversified its economy to crude oil production due to oil boom. After the diversification, there seemed to be a decline in global oil prices over the world, that yielded a negative result on the country's income and payment of imported goods (Miko *et al*, 2018). Thus, arouse the need to go back to agriculture.

In the agricultural sector, there are some setbacks which need to be addressed, for instance: Nigeria relied most on foods and agro-products that are brought into the country (Miko *et al.*, 2018), low yielding crop varieties, problems of pests and diseases, drought etc. that hinder agriculture. Genetically modified foods were introduced to Nigeria in 2001 by

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National Biotechnology Development Agency (NBDA) (Ajayi, 2017). The Agency in charge with the promotion, commercialization and regulation of biotechnological products.

For sufficiency and availability of food in Nigeria, the government had adopted the use of genetically modified foods (GMOs), a biotechnological tool for upgrading and better productivity towards enhancing socioeconomic status of Nigerian farmers and prosperity of national economy (Olugbenga, 2017). The GM foods such as Bt Cotton, Bt Maize, and Ht Soybean etc. were announced (Olaiton, 2017). The adoption of genetically modified foods in Nigeria had generated lots of disputes that geared towards the concerns of the genetics and health implications of taking such kind of foods.

### **Introduction of Genetically Modified Foods in Nigeria**

Nigeria has been a major producer and consumer of cowpea in the continent, but the produce has been imported to the country since 2004. However, it is affected by cowpea pod borer (*Maruca vitrata*) which can lead to severe losses of about 60 % yield (Miko *et al.*, 2018). A genetically modified cowpea known as Bt gene was donated by the Monsanto Company to the African Agricultural Technology Foundation for free license (Ezezika and Daar, 2012). An introgression of cry1Ab gene into local cowpea varieties was carried out in Nigeria. It was a gene formed from *Bacillus thuringiensis*, a soil bacterium, aimed at destroying some insects and maruca pod borer by producing protein. Fieldtrials with the gene were conducted in some areas of Zaria, Kano and Zamfara states of Nigeria (Ezezika and Daar, 2012).

Efforts were made by the International Institute for Tropical Agriculture (IITA) in Ibadan, Nigeria to avoid occurrence of virulent Cassava Mosaic Disease, which can result to food scarcity in the country (Dixon, 2006). The IITA was responsible for testing of genetically modified cassava produced by Donald Danforth Centre in St. Louis, United states that was launched in Nigeria (Olaniyan *et al.*, 2007). The GM cassava testing on the cassava mosaic disease failed to produce adequate result, thus the test was withdrawn by the IITA (Watch, 2005). A Bt cotton is another genetically modified cotton by Monsanto company, it was permitted for commercial release by the National Bio-safety Management Agency (NBMA). Multi- location trials have commenced by Institute of Agricultural Research (IAR), Zaria, the first trial took place in 2016 and the second in August 2017 in some specified locations in Nigeria, which was managed by the Mahyco Company with marvelous improvement (Miko *et al.*, 2018).

An insect's resistant maize by Monsanto Company has been allowed for field experimentation by the National Bio safety Management Agency, but yet to commence. A restricted farm examination of African bio-fortified sorghum enriched with vitamin A, iron and Zinc, is ongoing at the Institute of Agricultural Research (IAR), Zaria. In October 2015, the NEWEST rice project was commissioned by the National cereal research institute, Badagri. African Agricultural Technology Foundation (AATF) assisted the project, towards rapid rice production in flooded, poor nitrogen and saline environments (Gain, 2017). The IAR in partnership with African Agriculture Technology Foundation (AATF) commenced a research to address the *Maruca vitrata* attacks on beans in 2009. After ten (10) years of extensive research on a genetically modified cowpea, Nigeria felt it was deemed fit to commercialize it, the country has approved its first GM crop (Premium times, 2019). Bt Cotton, Bt Maize, ABS (African bio-fortified sorghum) and NEWEST rice are some of the genetically modified foods yet to be commercialized in Nigeria. Genetically modified foods are gaining more attention in Nigeria.

### **Nigerians' Perceptions towards GMF**

The introduction of genetically modified foods (GMOs) to Nigeria as to tackle food security and to alleviate hunger and poverty (Olaniyan *et al.*, 2007; Prakash *et al.*, 2011), by combating problems of insect, disease, drought tolerance, improve food quality and appearance (Prakash *et al.*, 2011) has turn in to a topic of discussion.

A study was carried out by Eneh *et al.* (2016) on the perception of GMFs in the market place of Enugu, Nigeria. The finding showed that the percentage of respondents with positive attitudes to GMFswere high (33.3%) than those with negative thoughts 28.3%. Among the participants; 26.7% were not sure and 11.7% were with different views. High percentages of the participants (58.3%) are willing to and/or eat GMFs, while 41.7% would not. Among the 58.3 % of participants; 38.3% would take GMFs based on nutritional benefits, 3.3% had passion for new things, and 16.6% for better taste and better looks. Some of the factors for the acceptance otherwise rejection of GE food by the respondents were; 55% thought they can affect health, 31.7% would not, and 13.3% were uncertain, 65% believed was artificial, 23.3% thought indifferently and 11.7% viewed them as neither artificial nor can cause health issues. Based on these factors; 61.7% of the respondents believed that the country should authorized the introduction and manufacture of GMFs, while 38.3%were against the legalization of these foods. Out of the 100 participants; 41.7 %were interested, 21.7% were fairlyinterested, 15% were neutral and another 21.7% were indifferent.

There was division among various institutions to the perception of GMOs; The Government, Agri-biotech investors and affiliated scientists are with the views that it would help in combating food scarcity, lack of environmental resource, weeds and disease infestations. On the other hand, the independent scientists, environmentalists, farmers and consumers warned that their introduction may pose new risk to food security, atmosphere and community health. Among these threats are environmental pollution and endangering biodiversity (Kumar and Haase, 2012). According to Mbadiwe (2018), organizations such as the Nigeria Institute of Food Science and Technology (NIFST), cautioned GM seedlings, viewed the seeds as unfavorable to the conventional seeds. There would also be a possibility of making the local seeds unproductive to the farmers and nation at large. They disagree with the Nigerian's biosafety institution and laws for the safety and the upholding of the local seeds. The Health of Mother Earth Foundation and Friends of the Earth Nigeria claimed the present of chemicals in some GM foods. Monsanto's maize was said to contained chemicals like glyphosphate formulations that can cause cancer by the International Agency for Research on Cancer (IARC) .The GM maize was brought into the country through improper channel.

The perceptions of GMFs by some non-governmental organizations were demonstrated by objections on the introduction of genetically modified foods to Nigeria. The organizations; (ERA/ FOEN), (HOMEF), (ANCOMU), (WEP), (RIFAN) and (NAWIA) Environmental Rights Action/Friends of the Earth Nigeria, Health of Mother Foundation, All Nigerian Movement Union, Women Environmental Programme, Rice Farmers Association of Nigeria and Nigerian Women in Agriculture respectively had prepared severe oppositions on the introduction of genetic modified maize and cassava as a food and to the agricultural sector of Nigeria. Appeals have also been made by these organizations to the National Assembly over efforts of (GM) maize and cotton being brought to Nigerian food scheme (Consumer International, 2005).

In another finding, the engineered foods were viewed as a channel of improving food production, maintenance of agriculture and aversion of global warming while others are of

the opinion that the introduction of GMOs is a means of invading and controlling the African countries through seeds and food system by the European and American (Ajayi,2017). A research carried out by Popoola *et al.* (2017) on the willingness of consumption of genetically modified food by the Nigerians, the finding showed that the GM foods may find better demand and acceptance by grown-up and average to big-size household. Consumers are more concerned on the ecological attributes of GM crops in terms of threats to climatic change and environmental pollution, but are ready to accept if the degree of benefits of these GMFs supersedes the major risks.

On the assessment of ex-ante economic on GMF in Benin, Niger and Northern parts of Nigeria, the result showed that the cowpea farmers preferred to grow and take Bt cowpea to conventional cowpea in Benin and Northern Nigeria. The preference was based on some health issues, despite being informed on the merits and limitations such as health risks of Bt cowpea (Gbègbèlègbè *et al.*, 2015). There was also a perception by government representative that most people argue against GM foods without proof experimentally, some of their arguments were intentionally made to deny the trust between project associates and the public members as reported by interviewee. Lack of proper GM information was reported as the factor to GMFs acceptance, as a result of non-interest on the engineered food by the scientists and fails rumour on GMOs perception (Ezezika and Daar, 2012).

Egbe *et al.* (2019) carried out an investigation on the study of GMFs awareness and approaches among the people of Kaduna state of Nigeria. The finding depicted most of the participants in the study knew about GM food (86%), but knowledge on the technology was low among the respondents. In the level of educational background of the partakers; degree holders are about 70.9% and 81.6% are post-degrees holders. They viewed standard of living would be improved by the GM technology and were ready to accept GM products. However, the majority of the respondents relied on the trust of Scientists and Religious leaders on the choice of GM foods. Social/public media and lectures were the sources of GM food information by the contributors.

An examination was carried out on the awareness on GMOs among Scientists; in research Institutes and Universities of Agricultural and Faculties of Agriculture correspondingly. It was reported that most of the scientists are informed of GMOs; they sourced information on these foods mainly through Journals. There was inadequate awareness (54.5%) on the effects of the foods on health and atmosphere by the scientists. There was an inconsiderable difference on GM foods awareness and attitudes among the scientists in the various fields (Oladele and Akinsorotan 2007).

According to a survey carried out by Emmanuel *et al.* (2021), the result showed that 56.75% of the participants strongly declared unaware of any negative outcome of GM foods on man's fitness. They believed frequent consumption of such foods is harmful, either to health, environment and the society. There exist a negative relationship between the respondent's to purchase, perception and their willingness to ACCEPT GM foods. Implying that; the perception of been harmful or not when consumed does NOT hinder the willingness to purchase the genetically modified foods. A weak correlation ( $r = 0.284$ ,  $n = 252$ ,  $p < 0.001$ ) was observed; the knowledge on effectiveness of GM foods against diseases, pests and herbicides and the enthusiasm by the public to patronize them. Information on the potential significance of GM foods in the Agricultural sector and Food industry is the driving force towards the want to purchase and consume more of GM foods and vice versa.

The purchasing strength to GM foods was investigated, where about 66.7% of the respondents approved that their purchase strength of GM foods is mainly influenced by the price (cost) of GM products or foods while 33.3% disapproved. Those that disapproved are ready to buy GM foods at any given price provided the product is modified genetically. Hence, the study demonstrated that; if prices for the GM foods are much more affordable, more people would buy while fewer people will purchase at a higher cost, within the study area (Emmanuel *et al.*, 2021)

The outcome of a study carried out by Oladipo *et al.* (2020) on GMF, showed that Nigerians were with different judgments on readiness to admit to GM crops. High concerned of GMOs on health issues were risen-up. Relevant stakeholders can use information from this finding to tackle problems of insufficient facts, disproof perception, and dispassion of GMOs. However, the study sample size was limited. Consumers International (CI) had taken part in figuring disputes on GM foods. It advocates an officially permitted rule that entails thorough safe testing, labeling verification exercises of all GM foods and making the producers responsible for any hazards on atmosphere and human fitness such foods can cause (Miko *et al.*, 2018)

Most of the European countries have banned the importation of GM food products into the countries. Nigeria exports her agricultural produce to Europe. Embarking on GM cultivation by Nigerian, would lead to the anxieties of prohibiting Nigeria to participate in marketing with certain European markets or the restriction of the country to the provision of only animal feeds. The difficulty and cost of transporting GM food to market and the lucrative return by agro-biotech companies on their investment is another factor. Many new GM crops are untested, and their intrusion is an immense fear to agribusiness (Ajayi *et al.*, 2017)

Investigation was conducted on awareness of GM foods on small scale Nigerian farmers. Results from the finding showed that most farmers (52.07%) neither heard nor do they know the benefits and price of GE foods, they are unaware of GM crops. The awareness on GM crops among the farmers was influenced by gender, educational background and seeds collection. Hence, wakefulness of the farmers on price and benefits of GM foods was determined by period of education and employment of reliable seeds source (Obi-Egbedi *et al.*, 2020). A work done by Oparinde *et al.* (2017), in assessment of farmers views towards cultivation of genetic engineered cassava (provitamin A). It was discovered that there was a remarkable interest in the cultivation of GM cassava by small scale farmers in rural areas with an optimistic outlook on the biotechnology. The reasons towards the willingness of farming the crop were due to its nutritional and low fertilizer requirement. A high capital requirement is the main drawback to adoption of provitamin A GM cassava by the farmers. It was also observed that behavioural reactions among the farmers may change when more information are available

A survey was done on the perception of GMFs in Jos University teaching hospital (JUTH) on medical doctors. The study revealed that; there is inadequate knowledge of GM foods among doctors in JUTH. They are of the believe that GM foods can pose negatively effect on human health, environment and the biodiversity. They are therefore unenthusiastic to consume GM foods (Daboer *et al.*, 2018). Students (318) from medical and dental departments from the University of Lagos were assessed on the understanding and approach to transgenic foods consumption. There were 53.1 % and 46.9 % female to male respondents, with average age range of  $21.3 \pm 2.67$  years. High percentage of familiarity on bioengineering and genetic modification of foods among the respondents was observed. Attitudes on the

GM foods is appreciably influenced by price between traditional and GM foods. It was proven that students from these Departments were aware of GM products, but has less understanding on GM technology; with negative attitude on the foods. Fears were shown on the safety of consumers, which would likely affect the preferences of traditional food to transgenic foods (Ebuehi and Ailohi, 2012)

In a research to examine the understanding about biotechnology and the thoughts to GM foods or products derived from the technology in southwestern part of Nigeria, 180 respondents were assessed, the participants have some knowledge on the technology but GM foods such as Bt maize, Bt cotton, and golden rice were less known. High proportions of the respondents were with positive views of GM foods introduction and are ready to consumed GM foods if they content high nutrients than the conventional food (Adeoti and Adewale, 2007). Nigerian scientists have been making efforts to reassure the populace that genetic engineered foods have no greater hazards to conventional foods. Biotechnology is important in ensuring food security issues which if not tackled would evade the country (Davies, 2009).

Yusufet *al.* (2020) in the determination of Farmers' enthusiasm to grow GM cassava enriched with vitamin A in Kwara state, found out that the pro-vitamin A variety is new to most farmers in the area. This was because there has no any effort made before on introduction of improved cassava varieties to farmers in the State. It was revealed that about (68.9%) farmers had never heard about the pro-vitamin with only about 30% aware. The majority (73.68%) out of the proportion that heard about pro-vitamin had never cultivated it. High proportion (75%) among this category gave unavailability of the stem cuttings as reason for non-cultivation, while 25% were not just captivated about the improved variety.

Oparinde *et al.* (2016) carried out assessment of consumers' acceptability of gari produced from modified yellow varieties; light yellow (YC<sub>1</sub>) and very deep yellow (YC<sub>2</sub>) fortified with vitamin A. The study was conducted in Imo and Oyo states of Nigeria using two different mechanisms (rating and auction). It was observed that light yellow variety (YC<sub>1</sub>) would probably be accepted in Oyo state and none of the modified varieties would possibly be accepted in Imo State. Abubakar (2011) in his study on awareness of GMF among the most common spoken languages in Nigeria within the higher socio-economic and educated group, showed that 75% believed that GM foods are unavailable while 22% of the respondent considered genetic modification as morally wrong while 70% did not view such practices as being immoral.

## **CONCLUSION**

In conclusion, the article reviewed reasons for the perception and acceptance of GMFs by the Nigerians. The controversies were based on the awareness, GM technology, nutritional benefits health implications (safety), environmental threat, price, being artificial, labeling and traceability requirements, making local seeds unproductive, ethical issues and most importantly economic development. The article also reviewed perceptions of GMOs by various institutions; governmental and non-governmental, doctors, students, farmers, scientists, Agriculturalists, individuals etc. across various parts of the country. Thus, arouse the pro and anti-genetically modified groups in Nigeria. .

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