Biotechnology awareness survey in Nigeria

National report

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Executive summary

This report presents the results of the national survey of public awareness of agricultural biotechnology in Nigeria. It is an attempt to assess consumer awareness of the innovation, given the launching of the Nigeria Agriculture and Biotechnology Project (NABP) in May 2004.

Five of the six geopolitical zones of the country southwest, southeast, north central, northeast, and northwest were covered by the survey. A team of experts was commissioned to conduct the survey in each zone. The teams met shortly after commissioning to agree on methodology and validate the research instruments.

Major stakeholders were identified and selected purposively and proportionally for fair representation. These included farmers, academics, politicians, students, market women, businessmen, policymakers, teachers, and members of nongovernmental organizations.

A pre-tested questionnaire was used for the exercise. A total of 900 Nigerians were sampled; 891 responded to the survey and were thus used for the analysis.

The survey assessed the knowledge and awareness of Nigerians about biotechnology generally, and their ability to relate the technology to their daily living. It examined awareness about specific policy issues, institutions concerned with biotechnology, and respondents' perceptions of risks associated with the innovation.

Survey results suggest that the Nigerian public is marginally aware of biotechnology. Those who are aware have heard something about biotechnology through stories in the news media. Most Nigerians, however, do not have a clear understanding of biotechnology and many still confuse the technology with conventional breeding techniques.

Nigerians are not very knowledgeable about national and international policy issues relating to biotechnology.

Nigerians are interested in the innovation and wish that it could be utilized to address the persisting problems of poverty in the country. Some of the respondents identify some research institutes and government agencies with issues of developments in biotechnology and would go to those institutions for information about the technology. One-third of respondents would be willing to eat genetically modified (GM) food if given the opportunity.

Introduction

Biotechnology refers to any technique that uses living organisms or substances from those organisms to make or modify a product, improve plants or animals, or develop microorganisms for specific uses. The technology is a modern-day continuation of an age-old tradition of selection and improvement of cultivated crops and livestock by farmers. The difference is that the new gene technology identifies desirable traits more quickly and accurately than conventional plant and livestock breeding (Persley and Doyle 1999).

Biotechnology is multidisciplinary with applications in agriculture, health, and the environment. Genetic engineering, which results in the development of products called genetically modified organisms (GMOs) is the contentious and most discussed aspect of biotechnology.

Modern science and technology offer tremendous opportunities for improving the well-being of current and future generations and the environment (Per-Pinstrup Andersen 2001).

However, they also embody risks and may be misunderstood unless adequate care is taken consciously to inform the populace of the benefits and processes of the innovation. This is important because, although the innovation could be beneficial to society, if the process of the technology is shrouded in secrecy, it is most likely to be misunderstood and therefore resisted.

Studies have shown that if knowledge about or experience of a topic is low, it was possible for people to base their perceptions on already present global attitudes towards the topic (Sanbonmatsu and Fazio 1990). One example is the controversy surrounding the use of GMOs as ingredients in food and agriculture in some countries.

Development scientists acknowledge the great potential of the technology to improve the livelihoods of millions of poor people of the world. For example, Flavell (1999) observed that given time and resources, the potential for improving all crops through these methods is enormous. The impact of biotechnology on food production, postharvest losses, and the nutritional value of food could improve the livelihoods of millions of poor people. Morrison (1999) submitted that "advances in biotechnology have provided a number of alternative vaccine delivery systems for subunit proteins that overcome the shortcomings of earlier ones and offer some of the advantages provided by live vaccines".

Plant biotechnology can deliver significant economic, environmental, and social benefits to millions of people, particularly resource-poor farmers, leading to improved livelihood. For example, rice that is genetically modified to contain vitamin A and iron would reduce the incidences of childhood blindness and anemia. Also, cotton that is genetically engineered with the Bt (*Bacillus thuringiensis*) gene provides a novel and effective method of controlling certain species of insect pests which could cause extensive yield losses.

In spite of these positive expectations, the use of genetically modified (GM) products has been largely controversial.

Public criticisms of genetic engineering tend to dwarf the known benefits of biotechnology, including some that have no direct bearing on gene manipulation such as plant tissue culture, genomics, and marker assisted selection. Hallman et al. (2001) observed, "The subject of GM food is a major source of controversy in many countries around the world". Some of the reasons usually expressed for negative perceptions of biotechnology reflect a lack of accurate information and exposure to misinformation. Lang et al. (2003) observed that public fears about bioengineering would be overcome if the public were given more information. Curtis et al. (2004), in a study of consumer acceptance of GM products in the developing world noted, "consumer skepticism is usually attributed to the unknown environmental and health consequences of genetically modified crops".

The Nigeria Agriculture and Biotechnology Project (NABP) is funded by the United States Agency for Development (USAID). The project aims to assist the Federal Government of Nigeria in laying the foundation for a sustainable biotechnology program by building institutional and scientific capacity to conduct research, implement priority regulatory guidelines and policies to create an environment for biotechnology

development, and increase public awareness of the benefits of biotechnology. The project was launched by the Honorable Minister of Science and Technology at a ceremony in Abuja in May 2004.

One of the project's three major objectives is to create awareness of biotechnology among the citizenry. This survey is therefore conducted to assess the present level of awareness and perception of agricultural biotechnology among various strata of the Nigerian population. A comparison of the level of awareness about biotechnology among the populace at the commencement and end of the project will give some indications on the impact of public awareness activities of the project. In addition, the results of this initial survey should enable the project to design appropriate strategies for effective public awareness.

Objectives of the study

The broad objective of the survey is to determine the level of awareness and understanding of the concept of biotechnology in Nigeria. The specific objectives are to determine and describe the level of awareness of biotechnology among Nigerians, elicit the use to which Nigerians wish biotechnology to be put, ascertain peoples' perception of the benefits and potential risks, and assess the willingness of Nigerians to accept products and services derived from GMOs.

Plan of the report

This report is a synthesis of the results of the survey on awareness about biotechnology carried out in five of the six geopolitical zones of the country by five teams of experts.

Methodology

Scope of the study

Five of the six geopolitical zones of the country each with a team of experts were covered by the survey (Table 1).

Table 1. Representative States for the study.

Zone	States in the zone	Representative State
1. Northwest	Kano, Kebbi, Zamfara Katsina, Sokoto	Kano
2. North central	Jigawa, Kaduna, Abuja FCT, Niger, Kwara, Kogi	Kaduna
3. Northeast	Borno, Yobe, Gombe Adamawa, Bauchi, Plateau Benue, Nasarawa	Bauchi
4. Southwest	Oyo, Osun, Ogun, Lagos Ondo, Ekiti,	Oyo
5. Southeast	Enugu, Anambra, Ebonyi Imo, Abia,	Enugu

(See Table 1).

Sources of data

The teams of experts met to design and validate the research instruments used for the survey. A structured and pre-tested questionnaire was used to collect primary data from the 891 respondents.

The major stakeholders in the society were identified and selection was both purposively and randomly carried out. Hence, the survey utilized a multistage random sampling technique to select the respondents.

Trained enumerators under close supervision of team members administered the questionnaire. The major categories of respondents formed the basic strata for the selection process. The country was stratified into zones and each zone into farmers, technocrats, politicians, researchers in relevant institutions, students, civil servants, environmental activists, members of religious groups, and nongovernmental organizations.

The sampling was conducted on the basis of the proportion of each category in the sampling frame. Concerted efforts were made to ensure adequate representation of each category of stakeholders. The selection process, though random, was made to ensure adequate representation of men and women, as well as rural and urban populations. Public and private sector employees were also included.

Table 2 shows the number of respondents in the different geopolitical zones and the frequency distribution. The sampling frame was 900; there were 891 responses, giving a response rate of 99%.

In addition, secondary data were obtained from journals and related publications including grey literature scattered in the libraries of various tertiary and research institutions.

Table 2. Number of respondents in each zone.

Zone	No. of respondents	Frequency
1	144	16.2
2	253	28.4
3	170	19.0
4	180	20.2
5	144	16.2
Total	891	100.0

Source: Field Survey 2004.

Methods of data collection

Data for the study were collected through oral administration of the questionnaire by trained enumerators. Enumerators were recruited locally since they were familiar with the environment, especially the language and culture.

The team members trained the enumerators in the various zones prior to the commencement of the survey. The survey team went through the questionnaire with the selected enumerators to make clear areas of ambiguity and emphasize the key variables of interest.

Where the respondents were literate, they were allowed to complete the questionnaire themselves. However, for those who could neither read nor write in English, the enumerators translated the questions to them in the common language and recorded their responses.

Method of data analysis

The data collected from the survey were collated and cleaned. Given the nature of the survey instrument and the data generated, descriptive statistics method was used in the analysis. This involved mainly tabular presentations of frequency counts and percentages, as well as the use of charts and histograms for the presentation.

Findings

Sample demographics

Demographic characteristics are important determinants of the attitudes, perceptions, and actions of human beings. Schoell and Guiltinan (1995) observed that friends, family, class, and culture, among other factors, influence consumers' perceptions and attitudes towards issues. Consequently, the prevailing socioeconomic characteristics and cultural attitudes may influence those respondents who have limited knowledge and understanding of biotechnology. It is in the light of this fact that the team of experts undertook an analysis of the socioeconomic characteristics of the respondents.

The results (Table 3) show that 77.8% of respondents were men and 22.2% were women. Their ages ranged from 18 to 72 years with a median age of 32.5 years. About 76% of the respondents were between the ages of 20 and 50 years, which is the active age bracket. This corroborates the submission of the National Population Commission that the Nigerian population is relatively "young". The Commission put the median age of Nigerians at 17.4 years, suggesting that 44.9% of Nigerians were under the age of 15 years in 1991 (NPC 1998).

Table 3. Sample demographics (N = 891).

|	Percentage
Men	77.8
Women	22.2
Marital status	
Single	21.8
Married	68.2
Education	
Primary	7.7
Secondary	16.5
OND/NCE	18.9
HND/BSc.	26.3
MSc./MBA.	21.7
PhD/DSc	3.6
Quranic/Adult Education	5.3
Age (in years)	
Less than 20	16.2
20–30	26.1
31–40	32.2
41–50	17.8
> 50	7.7
Monthly income (₦)	
Less than 10 000	23.7
10 000–20 000	30.4
20 000–30 000	16.6
30 000–40 000	12.3
40 000–50 000	9.9
More than 50 000	7.2

Source: Field Survey 2004.

That most (77.8%) of the respondents were men may be indicative of the gender imbalance in gainful employment in the country, since all those interviewed were employed in one way or another. More than two-thirds (68.2%) of the respondents were married. All those who were interviewed had one form of education or another. About (87%) of the respondents had at least secondary education. About a quarter (26.3%) of the respondents had a first university degree or its equivalent; however, the percentage of respondents who had at least a university degree was about 51.6% of the total.

Almost one-third (30.4%) of the respondents said their monthly income was between ₦10 000 and ₦20 000; about a quarter (23.7%) earned less than ₦10 000 monthly. Only 7.2% earned more than ₦50 000 monthly.

General awareness

The respondents were asked whether they had heard about biotechnology and if so, how, whether in conversation, at workshops, or through the various media. Results (Fig. 1) show that about two-thirds (63.2%) had heard of the term "biotechnology".

About 35.32% of the respondents had heard of biotechnology through the media in the form of public discussions essentially about general methods of improving/modifying agricultural products. The possibility of improved output similar to hybrid maize varieties provided the necessary interest in the subject matter and readiness to know more about the technique in certain areas of the northern parts of the country.
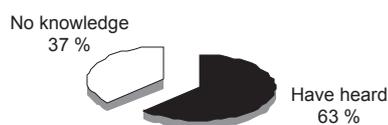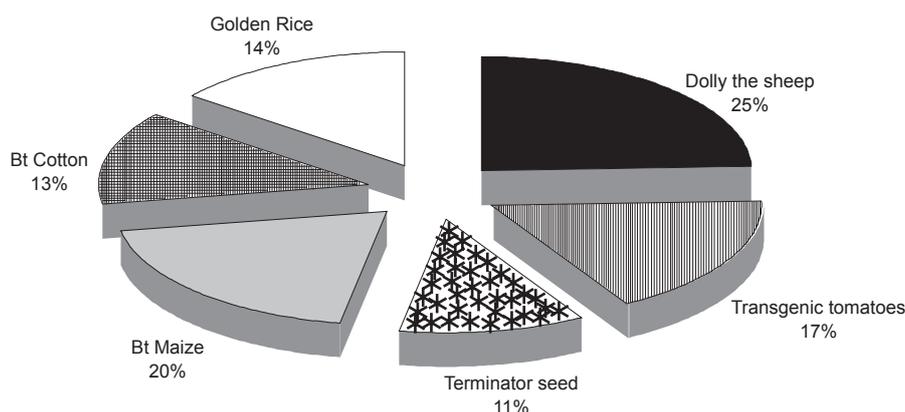

Figure 1. Awareness of Biotechnology.

"Academic workshops" and "library sources" provided significant sources of information after the mass media, which provided information on biotechnology to 41% of respondents (Fig. 2). This result confirmed the relative importance of the mass media in creating awareness to most people in various communities.
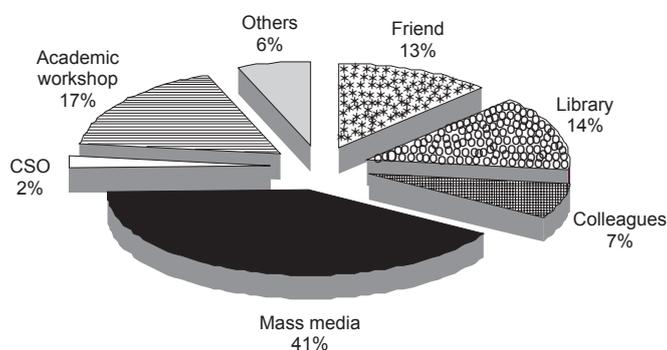
Figure 2. Sources of information about biotechnology.

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One quarter (25%) of the respondents indicated that they had heard of "Dolly the sheep" while 17% had heard about "Transgenic tomatoes" and 14% about "Golden rice" (Fig. 3). This is indicative of the interest of some members of the public in these products. It could be further suggested from the results that respondents would know more about the relevance of a particular crop/animal of interest in their environment. For example, "Dolly the sheep" would be of great interest to those involved in animal husbandry, particularly in the humid southern states of Nigeria, where it has been difficult to keep animals for commercial purposes. Animals could be modified to tolerate the high humidity and attendant pest problems of the south.
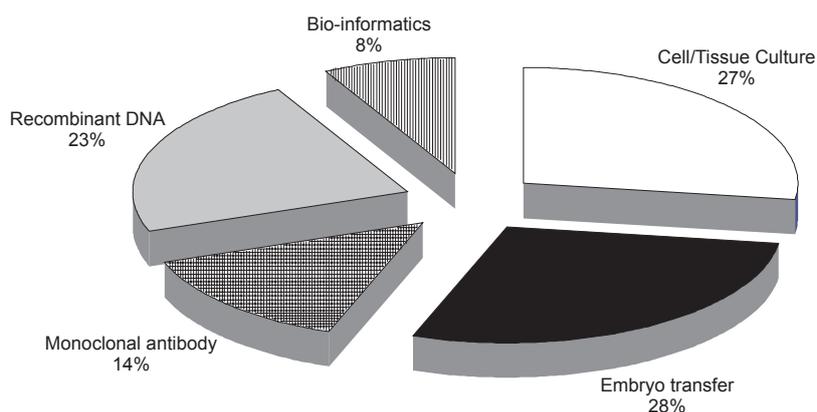

Figure 3. Awareness of specific biotechnology products.

The level of awareness of "Transgenic tomatoes" was fairly the same across the different geopolitical zones. Bt maize and Bt cotton are most commonly known in the northeastern and north central zones, which together constitute the major grain and cotton producing areas of the nation. "Golden rice" is best known in the north central and southeastern parts of the country.

Slightly more than one quarter (28%) of the respondents were aware of embryo transfer as a biotechnology method. Almost the same number (27%) was aware of cell/tissue culture as a specific biotechnology method. Only 8% were aware of Bio-informatics as a part of biotechnology (Fig. 4).

The observations made from this survey suggest that the respondents were not particularly very knowledgeable about the technology. It should be noted however, that awareness does not necessarily amount to detailed knowledge. In fact, in the case of biotechnology, the likelihood is that only a handful would have an understanding of the basics of the procedures involved.

A breakdown of the results revealed that more respondents from the southern parts (southwest and southeast) of the country were aware of both cell/tissue culture and embryo transfer than their northern counterparts. In fact, respondents in the southwest were more aware of all the biotechnology methods than those in other areas of the country. Institutions such as IITA, National Center of Genetic Resources and Biotechnology (NACGRAB), University of Ibadan, and Obafemi Awolowo University in the southwest may have contributed to the higher level of awareness of respondents from the zone.

Figure 4. Awareness of biotechnology methods.

Specific knowledge of biotechnology

One of the questions asked was whether respondents were aware of indigenous biotechnology efforts. This question was meant to ascertain if the people could relate their knowledge of the technology to their daily living. Results obtained showed that only one-third (30.4%) were aware of any indigenous biotechnology efforts of which 86% were from the southern parts of Nigeria (Fig. 5).
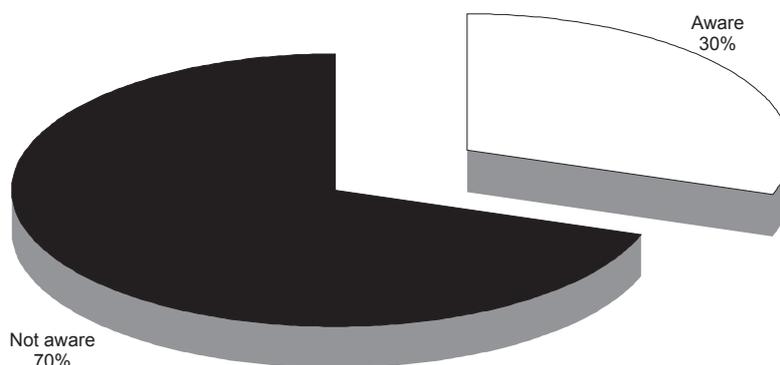

**Figure 5. Awareness of indigenous biotechnology efforts.**

Perceived advantages of biotechnology

Although majority of respondents (70%) were not aware of the innovation, those who knew of biotechnology recognized the perceived advantages and disadvantages (Fig.6). More than one-third (36%) perceived that biotechnology could help secure food self-sufficiency. Another one-fifth (22%) also felt that the innovation could improve human health. These results suggest that the few Nigerians who knew of biotechnology had a good idea of its advantages. Furthermore, the possibility of using biotechnology to combat food insecurity and poverty and improve health is possibly more relevant to Nigerians.

The implications of the innovation for human health, especially following the consumption over a length of time of bioengineered products seem to be the most important source of the anxiety. About 38% of respondents expressed concern about the possibility of the technology having adverse effects on human health. About one-fifth (22%) felt biotechnology could be environmentally unsafe (Fig. 7).

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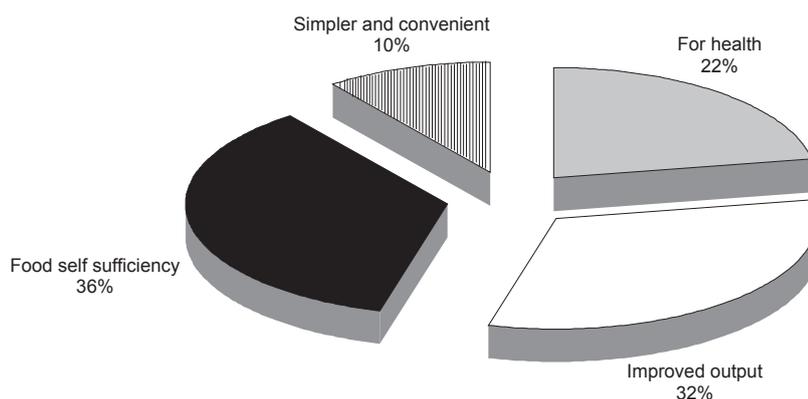
Figure 6. Percieved advantages of biotechnology.
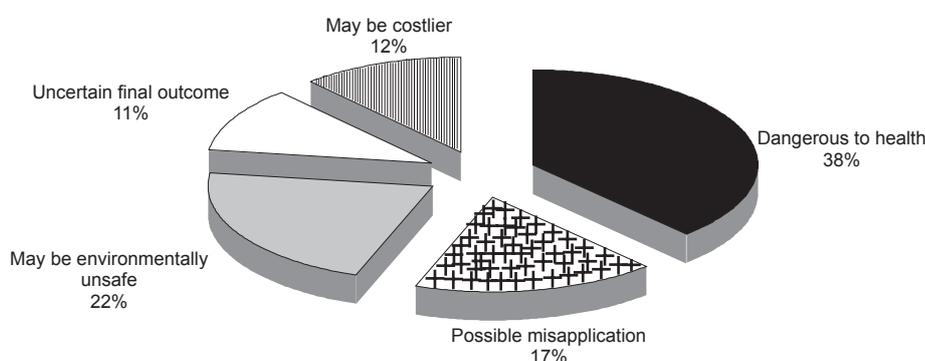
Figure 7. Envisaged disadvantages of biotechnology.

Awareness of Federal Government Institutions involved in biotechnology

The Federal Government of Nigeria has recognized that biotechnology could play important roles in enhancing the quality of life through production of higher yielding crops and livestock with added value to the products. Hence, the government has established some institutions and agencies to promote the use of this technology and also to regulate the products obtained from it. There were, however, variable levels of awareness among respondents on the existence of government institutions that have relevant activities related to biotechnology and biosafety (Fig. 8). One-fifth (20%) of respondents identified biotechnology with research institutes, as represented by the International Institute of Tropical Agriculture (IITA) closely followed by the National Biotechnology Development Agency (NABDA) with 19% of respondents. Sheda Science and Technology Complex (SHESTCO*)* which houses the country's advanced biotechnology laboratory was least recognized as a biotechnology-related institute. The low level of awareness of the existence of the advanced biotechnology laboratory at SHESTCO could be attributed to the fact that it is the youngest i.e., the most recently established of the institutions that make up the complex.
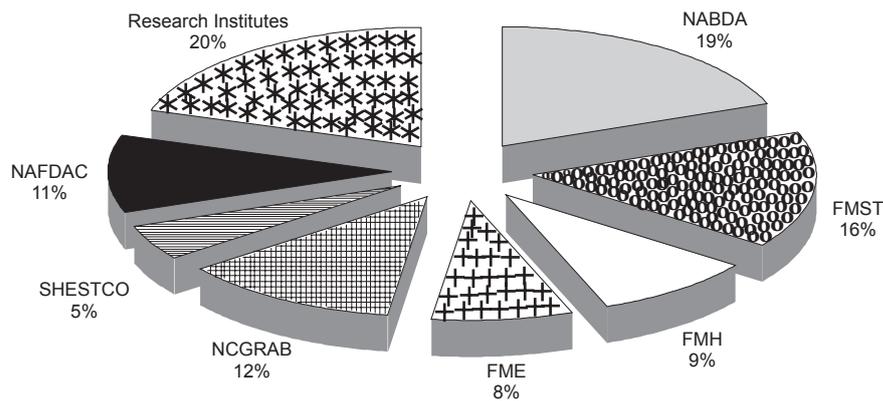
Figure 8. Awareness of Federal Government Institutions involved in biotechnology.

A closer look at the breakdown shows that each institution was better known in its immediate environment. NABDA is known by about one out of every two (53%) in the north central zone where it is located, and IITA by two out of every three (67%) in the southwest. SHESTCO is mostly known in the northwestern part of the country.

These institutions therefore need to create more awareness about their activities beyond their immediate environment.

Policy framework

Awareness of issues related to biotechnology at the international level was very low among the Nigerian populace as shown by results of the survey. Only 6.5 % of respondents claimed to know anything about issues of biotechnology at the international level.

This observation further attests to the low level of awareness of the innovation among Nigerians. Further probing into the specific policy framework on biotechnology revealed that only about one-quarter (24.3%) were aware of proprietary intellectual property rights, 37% knew of farmers' rights, and 28% of breeders' right. These results are at the awareness level and do not signify detailed knowledge of the issues involved in intellectual property. The results are not surprising, since most Nigerians know little about intellectual property rights and biotechnology.

Biosafety and issues of potential risks associated with biotechnology

When the respondents were asked if biotechnology products were safe to cultivate and eat, the results (Fig. 9) showed that about 24% felt it was safe to grow GM food crops while 23% felt it was safe to eat GM food. It is interesting to observe that about 20% were willing to eat GM food if given the opportunity.

The results probably suggest that the respondents had confidence in the ability of various Government Institutions to ensure the safety of biotechnology products. The willingness of almost half of the respondents to grow and eat GMOs is possibly an indication that the campaigns by anti-GMO groups had not reached many of them or they were indifferent to the claims made by the campaigners.

Only about one of five Nigerians (19.6%) claimed to have knowingly taken GM food. Of this number, about half claimed to have taken it in Nigeria, while 13.8% claimed to have taken it in Europe and 7.4% in USA. If the claims of the respondents are true, this suggests that GM foods may well have been finding their way into Nigeria without the knowledge of the biosafety regulatory authorities.
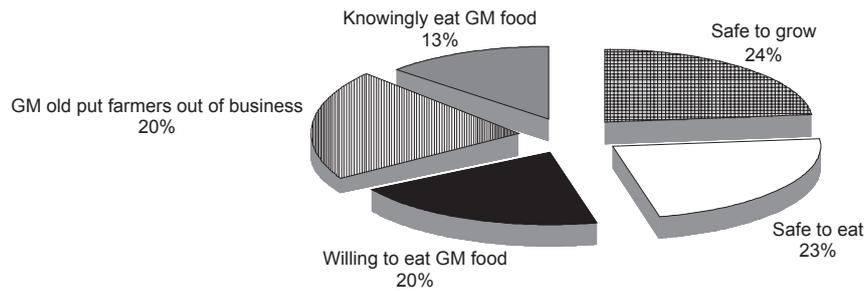
Figure 9. Biosafety issues.

Whereas majority of respondents expressed concerns about biotechnology products, 50.7% would be willing to accept GM foods if these were more nutritious while 36.3% would accept them if they were environmentally safe, and 28.5% would consume them if they were cheaper.

In other words, nutritional relevance and relative pricing are major factors that could determine whether Nigerians would accept or reject the products of biotechnology.

Ways in which Biotechnology products could be used

The survey results (Fig. 10) showed that over all, little is known about biotechnology and potential benefits that could be derived from it. However, when the question was asked on the way Nigerians felt the innovation could be used, about two-thirds (63%) felt biotechnology could be used to produce more agricultural products, while one in five (20%) felt it should be used to advance the medical sciences. It should be noted that these answers were obtained following explanations given by enumerators about the potential applications of biotechnology.

This suggests that the most important area where the technology would be most needed in the views of respondents is agriculture and food production. The farming population in the country is aging and productivity per unit area of land needs to be increased to make farming more attractive to the younger generation and provide adequate amounts of food for the increasing population get. These probably explain the respondents' answer to this question.
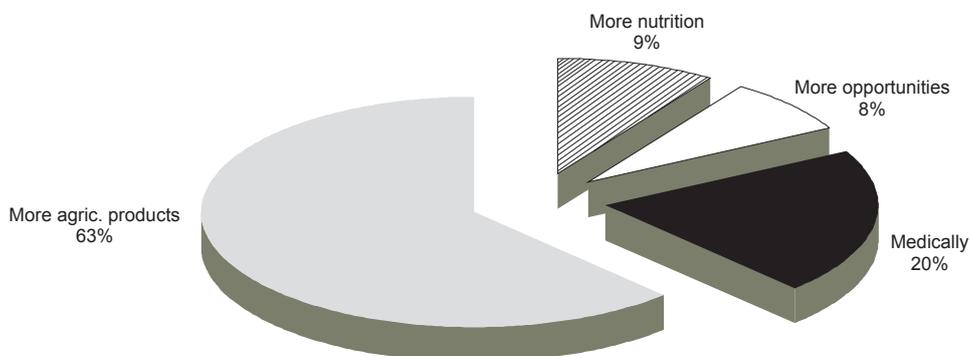
Figure 10. Ways biotech could be used.

Conclusion

Results of the survey show that Nigerians are mostly unaware of biotechnology; its presence in their lives and its wide application in agriculture and food production. Furthermore, most of the respondents had little understanding of the general facts about the transgenic technology. Many Nigerians claim to have heard some news about biotechnology, although the "news" or story is not detailed knowledge of the innovation.

Awareness of genetic engineering seems skewed geographically. People living in the southern parts of the country where, on average, the typical citizen has more western education, seemed more aware of the innovation than in the northern part.

The mass media appear to be the main mode of creating awareness or disseminating information, followed by academic workshops, and the library. Undoubtedly, the mass media are the major tools for creating awareness, hence, efforts aimed at promoting the innovation should note their relative importance.

In spite of the low level of awareness, Nigerians had some good idea of the advantages of biotechnology as an innovation. The possibility of using biotechnology to combat food insecurity was most appreciated.

Respondents were more aware of research institutes as agents of biotechnology, together with the National Agency for Biotechnology Development. In other words, Nigerians would most likely turn to these institutions for more information about the technology.

Very few Nigerians are aware of either national or international policy issues about biotechnology, such as intellectual property rights, breeders' rights, and even the national policy on biotechnology.

Few Nigerians feel it is safe either to grow or eat GM foods. Nigerians feel biotechnology could put small-scale farmers out of business and a few think the nation has the institutional capacity to deal with potential risks associated with biotechnology.

Nigerians would want biotechnology to be used to improve agricultural output, suggesting that ensuring food security is the most critical area of need of this innovation.

The opinions of Nigerians on biotechnology did not seem to stem from adequate information and more effective communication about the technology is highly desirable.

Given adequate information, many would be ready to adopt the innovation.

The results obtained from this survey suggest a need for intensive use of mass media and workshops for the dissemination of useful information about biotechnology and its relevance for contemporary Nigerian society. The need to address food insecurity and highly nutritious food products at affordable prices commends the innovation to Nigeria.

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