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Communicating Agricultural Biotechnology Among Farmers In Ebonyi State, Nigeria

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Abstract: *This study was carried out to investigate the impact of communicating agricultural biotechnology to farmers in Ebonyi state. This study was anchored on Diffusion of Innovation Theory. In conducting this research, descriptive research design was adopted. The population of the study was 2,880,383 from which a sample size of 400 was determined using Taro Yamane's formula. Multistage sampling technique was adopted to select samples while questionnaire served as instrument of data collection. Data collected were analyzed using SPPS frequency tables, percentages and arithmetic mean in a four-point likert scale. Findings showed that majority of the respondents were fairly exposed to agricultural biotechnology information through various sources of information outlets such as the mass media. It was also found that most of the respondents agreed that kind of information contents on agricultural biotechnology was on new crops and animal species while majority of them had poor cum negative attitude towards adoption of agricultural biotechnology products and practices. The study recommended that regular communication with farmers in Ebonyi State on the nature and application of agricultural biotechnology through various mass and social media outlets and platforms, communicating Ebonyi farmers on simple and affordable or applicable agricultural biotechnology devices, innovations and products by Agricultural Development Agencies and mass media campaigns on agricultural biotechnology should be designed with local language, contents and settings on acceptance and application of agricultural biotechnology by the farmers in Ebonyi State, Nigeria.*

Keywords: agricultural biotechnology, communication, farmers, information.

INTRODUCTION

In recent years, one of the areas in agriculture that has attracted concern from various stakeholders and farmers in most of the countries of the world in recent times is the idea of agricultural biotechnology. Agricultural biotechnology is the application of biotechnology to improve specific aspects of livestock or crops production (Odhong, 2013). It is the term used to refer to crop and livestock improvement through biotechnology (ISAAA, 2024). It is not limited to genetic modifications alone as commonly assumed, rather, it also includes conventional plant breeding, tissue culture and micro propagation, molecular breeding or marker-assisted selection and molecular diagnostic tools carried out in order to improve quality and quantity of farm produce.

Agricultural biotechnology was conceived and developed as an innovation that can bring about a transition from natural resource based to a science based system of agricultural production meant to address the constraints of global sustainable agricultural developments. It focuses on the collection of modem genetic engineering technologies that are directly applicable to agriculture, primarily for plant protection and animal health to make or modify them for specific uses (Yaffe, 2010). Technically, the United Nations report describes it as the use of living systems and organisms to develop or make products, or any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use (United Nations, 2016).

The rationale for the introduction of agricultural biotechnology is due to the wide spread of major agricultural pests which include pathogens, insects and weeds. Earlier, much of the pest control efforts were in the application of chemicals. It is estimated that the constraints posed by pest and pathogen control to sustainable agricultural growth is higher than those posed by both water and land. In addition, drought, low-yielding crop varieties, pests and diseases, poor soils, low fertilizer use, lack of irrigation and limited access to modern technologies are among the problems that plague agriculture especially in developing nations. These persistent challenges have prompted scientists to experiment with genetic modification (GM), a technique that allows the introduction of genetic material from one type of organism to another, in order to improve crop production and crop quality.

Modern agricultural biotechnology has the potential to play a large role in advancing agricultural productivity in developing country like Nigeria. Ambali (2024) reveals that the governments of Nigeria and Ghana have received praise for their leadership in promoting modern agricultural biotechnology in Africa. This technology represents the latest scientific progress in the new millennium aimed towards fighting the persistent food crisis situation of many developing

societies while protecting the environment for the future generation. To meet with the increasing demand for food and enlarge the prospect of food security in developing countries, increase in agricultural productivity through improvement in crop and livestock yield will be required but can best be achieved through agricultural biotechnology (Egwu, 2014).

Unfortunately, since the introduction of agricultural biotechnology as a method of improving agricultural production some years ago, it has been a subject of heated debate and controversy on how to effectively package the information and communicate the various concerned bodies, agencies, stakeholders, farmers, consumers of agricultural crops, plants and animal products for acceptance and adoption in many countries of the world. This is especially found in most of the developing countries like Nigeria where the technology has been received with much suspicion (Karembu and Nguthi (2011).

Communicating farmers on agricultural biotechnology has generated heat largely because of doubt, misinformation and limited understanding of agricultural biotechnology information. This can be certainly true because absence of a functional agricultural information delivery system has been one of the major constraints to agricultural development in Nigeria. for instance, Akinnagbe, Ukaegbu and Saddiq (2013) did a study on the role of agricultural extension services in communicating agricultural biotechnology in Abia State reveals the importance of disseminating farm information to farmers.

It is against this background that this study was conducted to investigate ways of communicating farmers on agricultural biotechnology information in Ebonyi State. Ebonyi State is one of the agrarian states in Nigeria where a lot of farmers are actively engaged in one type of farming or the other so as to make a good living.

Statement of the Problem

The issue of agricultural biotechnology as an innovation for improving agricultural production has been a subject of debate among farmers and stakeholders regarding their benefits and safety (Adenle, 2011). The controversial nature of genetically modified organisms (GMOs) requires careful communication to address public concerns and build trust. It is a debate that has generated much heat, largely because of the limited dissemination of biotechnology information to farmers and other players in the sub-sector. Most often, the general public and farmers in particular are not well informed about the nature of the biotechnology, its potential benefits and risks, and rarely do they participate in deciding what crops or problems agricultural biotechnology research and development should focus on (Akinnagbe, Ukaegbu and Saddiq, 2013).

The misconceptions and doubts affecting communication on agricultural biotechnology information has been a serious issue of worry and concern (Karembu et al, 2011). Available literature suggests that there may be lack of documented survey on the effectiveness of agricultural biotechnology information. This may negatively influence farmers' knowledge and application of agricultural biotechnology information, hence affect their attitudes and consequently pose challenges to the adoption of the innovation. There is need to clear this knowledge gap.

It is on this ground that this study was carried out to investigate the imperatives of communicating agricultural biotechnology information to farmers in Ebonyi State Nigeria with a view to generating empirical evidence on the state of agricultural biotechnology information in this area.

Objectives of the Study

The general objective of this study was to investigate communication on agricultural biotechnology among farmers in Ebonyi State. Specifically, this study has the following objectives to:

1. ascertain the level of exposure to information on agricultural biotechnology among farmers in Ebonyi State.
2. find out the kind of information on agricultural biotechnology communicated to farmers in Ebonyi State.
3. examine farmers' attitude to information communicated to them on agricultural biotechnology in Ebonyi State.

Research Questions

The following are the research questionsof this study:

1. What is the level of exposure to information on agricultural biotechnology among farmers in Ebonyi State?
2. What are the kinds of information on agricultural biotechnology communicated to farmers in Ebonyi State?
3. What is farmers' attitude to information communicated to them on agricultural biotechnology in Ebonyi State?

Significance of the Study

The significance of this study is viewed from three perspectives: empirical, professional and theoretical. Empirically, this study will contribute to the improvement of the level of communication on the attitudes and challenges to effective agricultural biotechnology among

farmers in Ebonyi State. The outcome of this study will also serve as reference material for scholars and researchers by adding to the volume of literature and empirical results that will be of immense assistance to future or further researchers.

This study will provide professional information that will help or guide farmers, agricultural journalists/communicators, agricultural biotechnologists, mass media houses, Open Forum on Agricultural Biotechnology (OFAB), Nigeria chapter, Federal and State Ministry of Agriculture (MOA), National Center for Biotechnology Information (NCBI), Agricultural Biotechnology Council (ABC) and other related organizations and agencies in the society.

Theoretically, to the academic community, this study will also offer a platform or basis for testing claims made earlier by scholars on agricultural biotechnology information and communication system with regards to addressing issues on the attitudes of farmers towards the dissemination of agricultural biotechnology information in Ebonyi State. By doing this, it will increase public awareness and knowledge on the subject matter and create ground for establishing and strengthening the ideas of agricultural biotechnology information system in Nigeria.

Scope of the Study

This study borders on communicating farmers towards agricultural biotechnology information in Ebonyi State. Ebonyi State is one of least created states in South east, Nigeria. It is naturally an agrarian state where majority of the residents are farmers. It is known for the production of Abakaliki rice (Ebonyi rice world) among other farm produce such as yam, cassava, potato, groundnut among others. There are some agricultural innovations and initiatives towards improving the level, quality and quantity of farm produce. Also in existence are Agricultural Development Agencies such as FADAMA 111and IFAD.

REVIEW OF RELATED LITERATURE

Agricultural Biotechnology and its Functions

Agricultural biotechnology is defined as a set of tools that uses living organisms (or parts of organisms) to make or modify a product, improve plants, trees or animals, or develop microorganisms for specific uses (ISAAA, 2014). However, as pertaining to food production, agricultural biotechnology is needed for crop and livestock improvement using biotechnology tools. The major aim of agricultural biotechnology is to improve crop characteristics such as yield, nutritional, disease/pest resistance or herbicide tolerance to a degree not often possible with

traditional methods. In essence, the big picture of biotechnology is to provide food security to the people (Oluwambe et al, 2017).

Biotechnology is a collective term that refers to a wide range of useful, enabling agricultural, industrial and medical technologies that includes, but not limited to genetic modification and manipulation that have wide applications in research and commerce. Biotechnology has been practiced by human society since the beginning of recorded history in activities such as brewing, baking and the production of fermented foods such as yoghurt and cheese. These technologies that utilize living organisms such as microbes, plants or animals, or parts of living organisms, such as cells or proteins have, over the past several decades (Neilson, 2001), become totally integrated into the practice of plant and animal breeding and microbiology.

The concept of biotechnology according to Agbo, Ebe and Odo (2013, p.17) encompasses "a wide range of procedure for modifying living organisms according to human purposes-going back to domestication of animals, cultivation of plants, and improvements to these through breeding programmes that employ artificial selection and hybridization". According to the American Chemical Society, biotechnology is the application of biological organisms, systems, or process by various industries to learning about the science of life and the improvement of the value of materials and organisms such as pharmaceuticals, crops and livestock.

The science of biotechnology can be broken down into sub disciplines called red, white, green and blue biotechnology (Nwakwo, Peters and Bokemann, 2009). Red biotechnology involves medical processes such as using organisms to produce new drugs or using stem cells to regenerate damaged human tissues and perhaps grow entire organs. White (also called grey) biotechnology involves industrial processes such as the production of new chemicals or the development of new fuels for vehicles. Green biotechnology applies to agriculture and involves such processes as the development of pest-resistant grains or the accelerated evolution of disease resistant animals. Blue biotechnology encompasses activities in the marine and aquatic environments, such as controlling the proliferation of noxious water-borne organisms.

Ozor (2008) reveals that agricultural biotechnology can be put into three categories: production-trait applications, output-trait applications and bioengineered products applications. The most common production-trait applications are herbicide tolerance and insect resistance which have been developed for extensive use in crops cultivation describe herbicide tolerance crops as being modified with a gene found in an oil bacterium that allows plants to metabolize herbicides. Insect

resistant varieties of maize, cotton, soybean and wheat, have been genetically modified to generate pesticidal property of Bacillus thuringiensis (Bt) that produces a protein toxic to certain insects.

Functions and Benefits of Agricultural Biotechnology

Biotechnology is being used to address problems in all areas of agricultural production and processing. This includes plant breeding to raise and stabilize yields; to improve resistance to pests, diseases and abiotic stresses such as drought and cold; and to enhance the nutritional content of foods. Biotechnology is being used to develop low-cost disease-free planting materials for crops such as cassava, banana and potato and is creating new tools for the diagnosis and treatment of plant and animal diseases and for the measurement and conservation of genetic resources. Biotechnology is being used to speed up breeding programmes for plants, livestock and fish and to extend the range of traits that can be addressed. Animal feeds and feeding practices are being changed by biotechnology to improve animal nutrition and to reduce environmental waste.

With the emergence of agricultural biotechnology, research shows that it is helping to heal the world by harnessing nature's own toolbox and using our own genetic makeup. Biotech improves crop insect resistance, enhances crop herbicide tolerance and facilitates the use of more environmentally sustainable farming practices (Timmer, 2003). Crops will be able to produce their own insect repellents and reduce the need for widespread usage of expensive and dangerous chemical inputs. Biopesticides would have minimal impact on the environment and help to reduce the public health costs of traditional pesticide usage which currently amounts to almost $3 billion annually.

Nnadi (2017) proposes the benefits of agricultural biotechnology could dramatically increase crop yield and quality, eliminate dependence on costly chemical inputs and ease the present burden on the rural environment caused by high level of pesticides and fertilizer use. Conversely, biotechnology development may result in environmental catastrophe and irreversible damage to earth's ecology. It is equally feared that once allowed to escape the laboratory, genetically engineered organisms could upset the fragile balance of the environment in ways unforeseeable and possibly unpreventable. Two sides of a coin, caution and balance are needed in harnessing the potential benefits the innovation has to offer in local and global agricultural production.

Akinnagbe et al (2013) reveals that agricultural biotechnology can play an important role in increasing production and improving the quality of food produced by farmers. Biotechnology promises to contribute to world food demands as well as deliver a range of environmental, health

and economic advantages. Agricultural biotechnology has the potential to make crop breeding and crop management systems more efficient thereby generating improved crop varieties and higher yields. According to FAO (2004), agricultural applications of biotechnology cover fields as diverse as traditional fermentation technologies used in food processing (that is, the process of bioconversion of organic substances by micro-organisms and/or enzymes of microbial, plant or animal origin), to the use of gene transfer techniques from one plant or animal species to another.

Communicating Agricultural Biotechnology

Communication and dissemination of information about agricultural productions plays a vital role in sustaining an effective agricultural extension service. Nwachukwu (2003) affirmed that agricultural communication is the effective transfer of agricultural technological innovation from technology developers to the technology utilizers. For agricultural information to be useful, the extension agents have to map out the information and communication needs of farmers within their agricultural and socio-economic systems and help key elements in that system to find information they need, when they need it, in accessible term and language, at prices that are realistic, at the given available resources and developmental objectives. Effective communication of agricultural information to farmers is of critical value in achieving optimum efficiency in agricultural extension administration and practice in Nigeria.

Biotech communication strategies must be linked with each country's cultural and political climate. Public support or consumer acceptance for biotech is crucial for deriving any benefits associated with the technology. It is driven by a number of interrelated factors: knowledge level, awareness of benefits, confidence, and trust. Communication is not merely a one-way process of dishing out information to people based on the assumption that lack of understanding stems from inadequate information or that ample information can compel action. Rather, it involves social negotiation and dialogue between and among varied audiences – policy makers, academicians, scientists, and ultimately, consumers (ISAAA, 2024).

The effectiveness of agriculture information system policy is measured to a large degree by the effectiveness of the management system. Communicating agricultural biotechnology in Nigeria involves engaging various stakeholders' scientists, policymakers, farmers, journalists, and the public through platforms like the Open Forum on Agricultural Biotechnology (OFAB) to foster understanding and dialogue on its benefits and potential risks. Key organizations, including the National Biotechnology Research and Development Agency (NBRDA), promote science communication to build informed decision-making for advancing regulatory policies and

innovations in the sector, which aims to enhance food (OFAB, 2023). The participation of various stakeholders in knowledge generation and validation assures responsible use of the technology and guarantees people of having a choice or say in its adoption (Pocket, 2016).

Communication therefore include these activities: inform or educate to help understand a policy or program; gather information to anticipate communication challenges; facilitate discussion among stakeholders; engage citizens for shared agenda setting and generate options; as well as partnering or reaching agreement among stakeholders. This is because as Mugwisi (2015) reveals, information of adequate quality is a necessary condition for improvement of all areas of agriculture. With the rapid development of Information and Communication Technologies (ICTs), data and information can be effectively generated, stored, analyzed, disseminated and used to support farmers and farming communities to improve agricultural productivity and sustainability.

According to Okeke, Nwalieji and Uzuegbunam (2015) effective communication of agricultural information to farmers is crucial in achieving optimum efficiency in agricultural practice in Nigeria. Agricultural communication practice in this information age has been recognized as an essential medium of disseminating information and advice to farmers and this is achieved through the ICT.,GSM, radio, television, projectors, internet, video, camera, computers, e-wallet etc. improving information flow and connecting people within the rural areas; answering questions relating to farm problems with the advantages of getting feedback using telephone; obtaining market price information, weather forecasts, etc are relevant areas of need of information and communication in agriculture.

Agbo, Ebe and Odo (2013) on the dissemination of agricultural biotechnology information and products to farmers through farmers' cooperative societies state that there is a paradigm shift from reaching farmers with biotechnology packages as individuals to use of their cooperative society platform. This is partly because farmers prefer to work in concert with other farmers when the chance arises. Farmers have also been found to diligently follow the paths charted by their leaders: be they opinion, religious or cooperative leaders. Available studies show that cooperative participation can play a significant role in the adoption process (Neilson, 2001). When a cooperative member adopts a new technology it is easier to share such knowledge with fellow cooperative members. This would then allow these offices to provide accurate information to members of the farming community under their guidance regarding the risks and benefits of GM crops, essential to allowing these farmers to make an informed decision about the use of GM crops

in their farming practice. These are important factors to consider when considering methods by which to raise awareness and improve understanding of GM crop technology (Eze, 2013).

Challenges of Agricultural Biotechnology in Nigeria

Agricultural biotechnology has some challenges facing it. Report shows that there is limited information, at times misinformation, about the health and environmental implications of transgenic crops. The issue of allergens and toxins arising from consumption of genetically modified crops and animal products has not been adequately studied. Adequate checks to ensure that the levels of naturally occurring allergens in foods made from transgenic organisms have not significantly increased above the natural range found in conventional foods have not been put in place (Dove, 2005). Also of great concern is the fear that techniques used to ensure that gene transfer in the course of genetic modification is successful can also lead to the emergence of anti-biotic resistant strains of bacteria.

Obidike (2011) reveals that rural farmers in Nsukka local government area of Enugu state are not noted to produce enough food, probably due to some constraints that lead to lack of access to timely and up-to-date information which would have enabled them to achieve optimal yield from their farmlands. Such information is highly desired by these farmers and can only be made available to them via extension workers, community libraries, state and local government agricultural agencies, e-mail or the World Wide Web (WWW) in a telecentre (Telecommons Development Group, 2000). In this modern day of information technology, telecentres provide the rural farmers with prompt and reliable information about what is happening in areas of improved seedlings, better methods of cultivation and fertilizer application, pest and weed control/eradication, new advances in livestock production and disease control etc. Where rural farmers are not faced with constraints in accessing agricultural information, traditional media such as rural radio, has been used in delivering agricultural messages to rural farmers. Other ways of delivering these messages to the rural farmers include print, video, television, films, slides, pictures, drama, dance, folklore, group discussions, meetings and demonstrations.

Agbaegbu (2018) in her report on the fuss about biotechnology and why says that in Nigeria, the challenges together with other constraints such as insect range expansion, extreme weather increase, weed pressure and Fulani herdsmen have broadened the scope of the impact. Agriculture, which needed to increase production by 70% to feed the population, is grossly affected by these natural hazards and disasters. Therefore, innovation and technology are fundamental to Agricultural transformation, in the reduction of major impacts and Nigerians, particularly farmers

need to make decisions under these extreme unstable and insecure circumstances. Besides, there is need to support farmers and increase access to innovation, impact policy and improve public perception. It should be noted that meeting the challenge of proving the safety of GM crops is not so easy. Apparently, it looks scientific, but not at all. Science can certify the existence of danger, but not its absence

Therefore, Obidike (2011) concludes that lack of access to basic agricultural information by rural farmers may be as a result of certain constraints has made farmers to stick to their old traditional methods of farming system and animal husbandry practice, hence resulting in poor crop and livestock productivity. Information and knowledge are very vital in agricultural development of any community and where they are poorly disseminated as a result of certain constraints, the community's agricultural development becomes highly impeded. Thus, it is important to consider the constraints of the rural farmers in accessing agricultural innovation and development information such as on agricultural biotechnology.

Theoretical Framework

Under theoretical framework, Diffusion of Innovations Theory (DIT) was adopted. Diffusion of innovations theory was propounded by Rogers in the early 1960s. It is described as the process in which an innovation is communicated through selected channels over time among members within a given society. The word 'innovation' refers to a new idea, product, technique or practice while the word 'diffusion' refers to the process of spreading such idea within a target group and adoption of innovation is a decision of full use of an innovation as the best course of action (Rogers, 2003).

Diffusion is a social type of communication process in that the message transmitted is designed to convey a new idea, reduce uncertainty, provide information and promote social change. This social change then leads to modernization in which individuals change from a traditional lifestyle to a more complex technologically advanced and rapidly changing standard of living.

The adoption of this theory for this study is anchored on its basic principle of innovation adoption. The import of this theory is that well-designed information can cause attitudinal change on the receiver by making him or her to successfully pass through the awareness or knowledge stage, persuasion stage, decision stage, implementation stage and confirmation stage. This is the reason in which the theory is adopted, to guide the researcher in investigating the attitudes of farmers towards agricultural biotechnology information in Ebonyi State, Nigeria.

Empirical Review

Ango, Illo, Abdullahi, Maikasuwa & Amina (2013) conducted a survey on the Role of Farm-Radio Agricultural Programmes in Disseminating Agricultural Technology to Rural Famers for Agricultural Development in Zaria, Kaduna State, Nigeria. The finding of the research reveals that majorities (90%) of the farmers were males, within their active productive ages (31-42 years) and 50% of them had attained Islamic education. Most of the farmers obtained agricultural information through radio agricultural programmes (97.8%) out of which majority had access to information through the format of presentation or discussion by an expert and or the extension workers (77.8%). The finding also revealed that farmers adopted the information disseminated through radio, which was found to be highly relevant (32.2%) to the farmers' agricultural activities.

In 2015, a study titled "Utilization of Radio Farmer Programme of Imo Agricultural Development Programme by rural Farmers in Imo State" by Okoroma, Nnadi, Anaeto, Echetama, Uche-Nwachi & Anaeto (2015*).* The study assessed the utilization of 'radio farmer' programme of Imo State Agricultural Development Programme (ADP) by rural farmers in Imo State, Nigeria. Specifically, the study described the demographic characteristics of the farmers; examined rural farmers' access to agricultural technologies disseminated through the "radio farmer" programme; assessed the extent to which the technologies were utilized by the farmers as well ascertained problems likely to constrain the effective utilization of the 'radio farmer' programme by the farmers. The result of this study revealed that majority (86%) of the farmers had formal education. 88% had access to the 'radio farmer' programme. Majority (91.7%) of the farmers were using the 'radio farmer' programme to access information on improved agronomic practices. It was therefore recommended that portable radio receivers which can be carried about should be provided for the farmers to enable them listen to the programme anywhere anytime.

Okwu, Kuku & Aba (2007) carried out a study on the "Assessment of use of Radio in Agricultural Information Dissemination: A Case Study of Radio Benue in Nigeria". This study investigated the use of radio as a medium of agricultural information delivery to farmers in Benue State, Nigeria. The objective was to determine the impact of radio agricultural programmes on the target audience (farmers). The study revealed that majority of the respondents (66%) listened to agricultural programmes on Radio Benue. The remaining respondents (34%) did not listen to the programmes due to either inaccessibility to radio sets, non-awareness of the programmes or unsuitable time of presentation. Generally, the listeners found the messages relevant to their information needs. The major determining factor for listening frequency among the respondents was time of presentation of the programmes. The respondents complained that the programmes were aired mostly in the

mornings and afternoons when they were on their farms and too busy to listen to radio. They also complained that the programmes were aired more often in English language than in local languages they understood better.

Oriare (2016) conducted a study on the Assessing the Utility of Radio in Communicating Agricultural Biotechnology in Africa: Case Studies of Burkina Faso and Kenya. The study funded by the International Development Research Centre (IDRC) was conducted by ISAAA and its partners from September 2008 to April 2011. The study sought to provide empirical insights on how radio can be used to promote accurate and fair understanding of newly emerging scientific innovations, in particular, agricultural biotechnologies. Key findings of the study revealed that radio remains the most favourite and popular medium among the rural communities compared with other mass-media channels such as TV or newspapers and that only few experts in the field are not enthusiastic about sharing knowledge with the farmers because of their inability to translate technical biotechnology terms (jargon) into local languages for radio listeners. Scientific experts were wary of appearing on radio shows alongside anti-biotechnology campaigners in case the discussion degenerated into angry and fruitless argument-which actually happened in one of the shows during the experimental campaign.

Orata (2014) did a study on the Relevance of communication channels in increasing agriculture production in Nigeria the aim objective was to find out the relevance of communication channels in increasing agriculture production in the country. Research method used was descriptive research. Data was collected from documents. The population for the study was 185. Research findings are: Lack of knowledge of the information needs of users constitutes formidable barriers to information communication. Information agents seemed to be ignorant of users' information needs. Lack of cooperation among related information systems create barriers to information flow. Sampling technique: Taro-Yamane sampling technique was used giving us a sample size of 102. The study recommended that: Information agents should study the users in order to discover and use the best acceptable method to disseminate information to their audience.

METHODOLOGY

Research Design

This study adopted survey research method. The choice of a research design is succinctly appropriate since the research has to do with gathering information from the people on vital facts about them, their beliefs, opinion and behaviours with regard to the problem of the study. Since

this study borders on communicating farmers on agricultural biotechnology in Ebonyi state, survey method was used because of the largeness and vastness of the area of coverage.

Area of the Study

The study was conducted in Ebonyi State, one of the States in South East geo-political zone of Nigeria. The choice of the area is because Ebonyi state is one of the agricultural-based states in Nigeria. It was carried out to ascertain the impact of communicating agricultural biotechnology information to farmers in Ebonyi State. By history and nature of Ebonyi State, it was carved out from the old Abia and Enugu State in October 1, 1996 with its capital at Abakaliki. The State has thirteen (13) Local Government Areas located under the three senatorial zones, namely; Ebonyi North, Ebonyi Central and Ebonyi South. Ebonyi state has eleven Local Government Areas, clustered in three senatorial zones that make up the state.

Population of the Study

The population of this study was made up of 2,880,383 people of Ebonyi state. It was drawn from the National Population Commission of Nigeria and National Bureau of Statistics (2022) projected population size report.

Sampling Size Determination

On determining the sample size of this study, Taro Yamane's formula was used. The formula is expressed as:

$$S = \frac{N}{1+N\,(e)^2}$$

Where s= Sample size

n= Population Size

e= Level of significance or error

1 = Constant

Therefore; $\frac{2,880,383}{1 + 2,880,383(0.05)2}$

n = 399.99 and approximately 400 (as sample size).

Sampling Technique

In order to select the actual respondents from the determined sample size, the researcher adopted multi-stage sampling technique. Firstly, cluster sampling technique was used to the three senatorial zones of the State namely: Ebonyi North, Ebonyi Central and Ebonyi South. The second stage was the use of purposive technique to select one Local Governments Area (LGA) from each senatorial

zone. The LGAs are Izzi LGA in Ebonyi North, Ikwo LGA in Ebonyi Central and Afikpo South LGA in Ebonyi South respectively.

The third stage was adoption of simple random sampling to select five political wards of each LGA. Thus, in Izzi LGA, Abgaja Mgbo, Ezza Inyimagu Izziogo, Magbukwu Inyimagu 1, Ndieze Inyimagu and Agbaja Offia Onwe wards were selected. In Ikwo LGA, Enyibichiri, Ndiagu Achara, Ndufu Amagu, Igbudu and Eka Awokewards were studied while in Afikpo South LGA, Amangwu Edda, Ebunwana, Oso-Edda, Amiri Ekoli and Owutu-Edda wards were equally be selected for this study. From each of the above selected political wards, simple random sampling method was used to select the individual respondents that were administered with instrument of data collection on the research problem.

Instrument of Data Collection

This study used questionnaire as instrument of data collection. The questionnaire was structured and used to elicit quantitative data from the respondents regarding their demographic and psychographic disposition and on agricultural biotechnology information. The questionnaire for data collection has two parts namely: Part A and Part B. Part 'A' was used to determine respondents' demographic characteristics such as sex, age and level of educational attainment while Part 'B' contained four questions structured on a four-point likert scale of (SA) Strongly Agree=4, (A) Agree = 3,(D) Disagree=2 and (SD) Strongly Disagree=1. Each of the questions addresses one specific research question of the study.

Validity of Research Instrument

The structured questionnaire was subjected to both face and content validation. It was subjected to critical assessment by the researcher's supervisor in the Department of Mass Communication, Ebonyi State University, Abakaliki and his input immensely validated the instrument.

Reliability of Instrument

In determining the reliability of the instrument-questionnaire, a pilot test of internal consistency was conducted at locations with characteristics similar to the areas of study to ascertain the reliability of the research instrument (questionnaire). In conducting the reliability test for the instruments for the data collection of this study, the test re-test technique was adopted to establish the reliability of the research instrument. It was carried out using Pearson correlation. The Statistical Package for Social Sciences (SPSS) was used to analyze the data from the two tests

and then the result shows a Pearson r correlation coefficient reliability coefficient of 0.76. This is an appropriate reliability coefficient for this nature.

Methods of Data Collection and Analysis

The questionnaire was administered directly to the respondents by the researcher after which filled copies were collected and used for analysis. After data collection, descriptive statistical method was used to analyze them. The statistical tool that was used in analyzing the data collected from the field work was SPSS method.

Results

A total of 400 copies of questionnaire were distributed to randomly selected participants within the state. Then, 386, representing 96.5% percent of them were returned and analyzed with SPSS method via frequency tables and percentages.

Table 1: Sex distribution of respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	286	74.1	74.1	74.1
	Female	100	25.9	25.9	100.0
	Total	386	100.0	100.0	

From table 1, majority of the respondents were males representing 74.1%. Female respondents involved in the survey were 100(25.9%). This shows that more males participated in the survey.

Table 2: Age categories of respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18 – 25 years	11	2.8	2.8	2.8
	26– 30 years	20	5.2	5.2	8.0
	31 – 35 years	51	13.2	13.2	21.2
	36 – 40 years	169	43.8	43.8	65.0
	41- 45 years	84	21.8	21.8	86.8
	46 - 50 years	36	9.3	9.3	96.1
	51- 55 years	10	2.6	2.6	98.7
	56 and above years	5	1.3	1.3	100.0
	Total	386	100.0	100.0	

From table 2, majority of the respondents were within the age bracket of 36 - 40 years representing 43.8%. Respondents within 41 – 45 years were 84(21.8%), those within 31 -35 years were 51(13.2%) and respondents within the age bracket of 56 years and above were 5(1.3%) which is the least. This is a clear indication that majority of the respondents were within the age of 36 - 40 years.

Table 3: Educational distribution of respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No formal education at all	8	2.1	2.1	2.1
	First school leaving certificate	114	29.5	29.5	31.6
	Senior secondary school exam	171	44.3	44.3	75.9
	OND/Nat. Certificate Exam	68	17.6	17.6	93.5
	Higher national dip/bachelor degree	20	5.2	5.2	98.7
	Higher/ post graduate degree	5	1.3	1.3	100.0
	Total	386	100.0	100.0	

The percentages of the respondents' educational qualifications are shown in the table above. They are as follows: No formal Education 2.1%, FSLC 29.5%, WASC/SSCE 44.3%, OND/NCE 17.6% and the least response Higher/Post graduate degree 1.3%. This shows that on the average that the respondents in the survey were mainly senior school certificate holders.

Table 4: Marital status of the respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Single	93	24.1	24.1	24.1
	Married	192	49.7	49.7	73.8
	Divorced	30	7.8	7.8	81.6
	Widowed	71	18.4	18.4	100.0
	Total	386	100.0	100.0	

The data displayed on the table above shows that respondents who were married were 192(49.7%) and are in the majority while those that were least represented were the divorced 30(7.8%). The data shows that more married respondents were involved in the survey.

Table 5: Religious affiliation of the respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Christian	281	72.8	72.8	72.8
	Islam	15	3.9	3.9	76.7
	African Traditional Religion	90	23.3	23.3	100.0
	Total	386	100.0	100.0	

From the table above, majority of the respondents were Christians 72.8%. Those who identified with Islam were just 15 respondents. This shows that Christians participated more in the survey.

Table 6: Respondents' knowledge of farming practice

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	High Knowledge	344	89.1	89.1	89.1
	Average Knowledge	42	10.9	10.9	100.0
	Low knowledge	0	0.0	0.0	00.0
	No knowledge	0	0.0	0.	00.0
	Total	386	100.0	100.0	

From the table above, majority of the respondents had high knowledge of farming with 89.1% while few of them with 10.9% had average level of knowledge in farming. None of the respondents said low or no knowledge level of farming.

Table 7: Analysis of data on respondents' or farmers' level of exposure to agricultural biotechnology information communicated to them

S|N	Statements	SA	A	D	SD	Mean($\overline{X}$)
i	I have heard about agricultural biotechnology on modern farming practice	10 (2.6)	170 (43.9)	200 (21.7)	6 (1.6)	2.01
ii	I am aware of information on agricultural biotechnology.	208 (53.7)	162 (41.9)	10 (2.6)	6 (1.6)	2.98
iii	It has not been long I was exposed to agricultural biotechnology	8 (2.1)	4 (1.0)	225 (58.1)	149 (38.5)	1.75
iv	I have knowledge of it very well and do grow modified crops in my farms	159 (41.1)	2 (0.5)	7 (1.8)	218 (56.5)	2.42
v	I heard that biotechnology in agriculture is used in the production of quality crops and animal products.	11 (2.8)	236 (61.0)	135 (34.9)	4 (1.0)	2.91
vi	Agricultural biotechnology information seems to have been existence in recent times Nigeria	8 (2.1)	6 (1.6)	241 (62.3)	131 (33.1)	2.11

When respondents were asked in table 7 if they have heard about agricultural biotechnology on modern farming practice, majority of the respondents said they disagreed with Entries on if the respondents had heard about agricultural biotechnology on modern farming practice, 10(2.6%) said they strongly agreed, 6(1.6%) said they strongly disagreed 170(43.9%) respondents said they agreed. The mean response for their statement shows that the majority candidly support their choice of response.

Entries on the awareness of information on agricultural biotechnology by farmers show that majority of them, 208 (53.9%) indicated 'strongly agree' while 162 (41.9%) indicated 'agree'. 10 (2.6%) indicated 'disagree' and 6 (1.6%) indicated 'strongly disagree'. Their mean response ($\bar{x}$ = 2.98) were further subjected to a mean comparison with the mean acceptance level of 2.5 ($\bar{x}$ = 2.5). It was subsequently accepted. This shows that majority of them had knowledge of agricultural biotechnology information on agricultural practice.

Entries in table 11 and figure 11item 9 revealed that majority of the respondents indicated 'disagree' 225(58.3%). 149(38.5%) of the respondents strongly disagreed that it has not been long they were exposed to agricultural biotechnology information, 8(2.1%) respondents said they strongly agreed with the statement and 4(1.0%) respondents said they simply agreed. The mean

response of the respondents ($\bar{x}$ = 1.75) was verified using a theorized acceptance mean value of 2.5($\bar{x}$ = 2.5). It was rejected since the mean response rate is less than the mean acceptance.

From the table above, 218(56.5%) respondents said that they strongly disagreed that they have knowledge of it very well and do grow modified crops in my farms. 159(41.1%) said they strongly agreed with the statement. 2(0.5%) indicated 'agree' while 7(1.8%) indicated 'disagree'. Their mean response ($\bar{x}$ = 2.42) clearly shows that the respondents were sure that they don't use agricultural biotechnology in food production.

Based on the data displayed in the table, respondents who agreed were 236(61.1%). Only 135 respondents did not have any serious time exposure to agricultural biotechnology. 11(2.8%) said they strongly agreed with the statement while 4(1.0%) simply said they strongly disagreed. The mean response rate shows that the respondents in actual sense had heard that biotechnology in agriculture is used in the production of quality crops and animal products.

From the table above, 241(62.4%) respondents said that they disagreed that Agricultural biotechnology information seems to have been existence in recent times Nigeria when they were asked. 131(33.9%) said they strongly disagreed. Only 6(1.6%) respondents said they agreed with the statement and 8 (2.1%) respondents said they strongly agreed with the statement. Their mean response ($\bar{x}$ = 2.11) clearly shows that the respondents were sure that agricultural biotechnology information seems to have been existence in recent times Nigeria.

The grand mean value of the computed means (2.01, 2.98, 1.75, 2.42, 2.91 and 2.11) in research question one was 2.36($\overline{\overline{X}}$ = 2.36). This shows that majority of the respondents were moderately exposed to agricultural biotechnology information.

Table 8: Analysis of the kind of information on agricultural biotechnology communicated to farmers in Ebonyi State

S|N	Statements	SA	A	D	SD	Mean ($\overline{X}$)
19	Agricultural biotechnology information focuses on improved crops and animal production	144 (37.2)	2334 (60.5)	3 (0.3)	5 (1.3)	2.95
20	Agricultural biotechnology information introduces new and healthy hybrids of crops and animals species	6 (1.6)	200 (51.7)	174 (45.0)	6 (1.6)	3.22
21	It clears negative views and doubts about agricultural biotechnology application in farming	116 (30.0)	258 (66.7)	8 (2.1)	4 (1.0)	3.14
22	It assures farmers of healthy productive nature of genetically modified crops	198 (51.2)	7 (1.8)	176 (45.5)	5 (1.3)	2.74
23	It reveals the safety and security of agricultural produce	10 (2.6)	210 (54.3)	163 (42.1)	3 (0.8)	2.83

From the table above, 234(60.6%) respondents agreed that agricultural biotechnology information focuses on improved crops and animal production. 144 respondents representing 37.2% strongly agreed with the statement, 3(0.8%) respondents indicated 'disagree' and 5(1.3%) respondents indicated 'strongly disagree'. The mean response for the respondents was 2.95 ($\bar{x}$ = 2.95). Since this is above the acceptance criterion 2.5 ($\bar{x}$ = 2.5). The statement is accepted. This implies that agricultural biotechnology information focuses on improved crops and animal production.

In the table also, responses to the statement: *Agricultural biotechnology information introduces new and healthy hybrids of crops and animals species*, showed that majority 200 (51.8%) of the respondents agreed that agricultural biotechnology helped in the introduction of new crop and animal species. 174 respondents representing (45.0%) indicated 'disagree', 6(1.6%) respondents indicated 'strongly disagree' and 6(1.6%) respondents also indicated 'strongly agree' as well. These responses were further subjected to mean comparison which revealed ($\bar{x}$ =3.22). The mean value was above the acceptance level of 2.5 ($\bar{x}$ = 2.5). As a result, the statement was accepted. This shows that the respondents believed that agricultural biotechnology information helped in the introduction of new crop and animal species.

From the table above, 258(66.8%) respondents agreed that information from agricultural biotechnology helped in clearing of negative views about its application in farming. 116

respondents representing 30.0% strongly agreed with the statement, 8(2.1%) respondents indicated 'disagree' and 4(1.0%) respondents indicated 'strongly agree'. The mean response for the respondents was 3.14 ($\bar{x}$ = 3.14). Since this is above the acceptance criterion 2.5 ($\bar{x}$ = 2.5). The statement is accepted. Response from the respondents showed that they supported their claim.

From the table above, 198(53.7%) respondents strongly agreed that agricultural biotechnology information assures farmers of healthy productive nature of genetically modified crops. 176 respondents representing 45.5% disagreed with the statement, 7(1.8%) respondents indicated 'agree' and 5(1.3%) respondents indicated 'strongly disagree'. The mean response for the respondents was 2.74 ($\bar{x}$ = 2.74). Since this is above the acceptance criterion 2.5 ($\bar{x}$ = 2.5). The statement is accepted. This implies that agricultural biotechnology information assures farmers of healthy productive nature of genetically modified crops.

Based on the data displayed in the table above, respondents who agreed were in the majority with 210(54.4%). The respondents who indicated 'disagree' were 163(42.1%), 10(2.6%) respondents said they strongly agreed and 3(0.8%) respondents indicated 'strongly agree'. The mean response for the respondents based on the statement addressed was 2.83 ($\bar{x}$ = 2.83). This is above the mean criterion for acceptance ($\bar{x}$ = 2.5). This means that the statement addressed was highly supported by majority of the respondents.

The grand mean value of the computed means (2.95, 3.22, 3.14, 2.74 and 2.83) in research question three was 2.97($\overline{\overline{X}}$ = 2.97). This shows that majority of the respondents agreed that information contents on agricultural biotechnology which they received was moderate.

Table 9: Analysis of farmers 'Attitude to the use of agricultural biotechnology information in Ebonyi State

S|N	Statements	SA	A	D	SD	Mean ($\overline{X}$)
24	I have accepted agricultural biotechnology information in farming	3 (0.8)	5 (1.3)	243 (62.8)	135 (34.9)	2.37
25	I like agricultural biotechnology information to have genetically modified products	170 (43.9)	5 (1.3)	204 (52.7)	7 (1.8)	2.24
26	I have practiced agricultural biotechnology information in my farms	9 (2.3)	174 (45.0)	197 (50.9)	6 (1.6)	2.41
27	I do plant crops based on agricultural biotechnology information I received.	181 (46.8)	2 (0.5)	194 (50.1)	9 (2.3)	2.36

28	Agricultural biotechnology information has encouraged other farmers and consumers on the benefits of the application	3 (0.8)	184 (47.5)	4 (1.0)	195 (50.4)	2.48
29	Agricultural biotechnology information has made me to have interest in its made crops and animals	5 (1.3)	6 (1.6)	221 (57.1)	154 (39.8)	2.10
30	Agricultural biotechnology information has not been well adopted by farmers in the state	198 (53.7)	7 (1.8)	176 (45.5)	5 (1.3)	2.74

From the table above, 243(63.0%) respondents disagreed that they accept agricultural biotechnology application in farming while 135 respondents representing 34.9% strongly disagreed with the statement. The least responses were 3(0.8%) respondents who strongly agreed with the statement. The mean response for the respondents was 2.37 ($\bar{x}$ = 2.37). Since this is below the acceptance criterion 2.5 ($\bar{x}$ = 2.5). The statement is rejected. This implies that the farmers examined still had some reservation about agricultural biotechnology application in farming.

Based on the data displayed in the table above, respondents who disagreed that they acquire agricultural genetically modified product were in the majority with 204(52.8%). The respondents who indicated 'strongly agree' were 170(43.9%), 5(1.3%) respondents indicated 'agree' and 7(1.8%) respondents indicated 'strongly disagree'. The mean response for the respondents based on the statement addressed was 2.24 ($\bar{x}$ = 2.24). This is below the mean criterion for acceptance ($\bar{x}$ = 2.5). This means that farmers do not acquire agricultural genetically modified product.

Entries in the table above show the response degree for respondents regarding application of agricultural biotechnology in farming. An overwhelming majority of the respondents 197(51.0%) disagreed with the statement. The least response category were respondents who indicated 'strongly disagree' with 6(1.6%). To buttress the data presented above, the mean response ($\bar{x}$ = 2.41) showed that the farmers don't hope to apply agricultural biotechnology in their farms since it is lower than the mean decision criterion ($\bar{x}$ = 2.5).

Entries in table above, shows response to the statement: *I do plant crops based on agricultural biotechnology information I received.* Majority, 194(50.3%) indicated 'disagree', 2(0.5%) indicated 'agree', 9(2.3%) indicated 'strongly disagree' and 181 (46.8%) indicated 'strongly agree'. Their responses where further subjected to mean comparison which showed ($\bar{x}$ = 2.36). This score was below the acceptance level of 2.5 ($\bar{x}$ = 2.5). It was subsequently rejected. We can conclude from this that the farmers do plant crops based on agricultural biotechnology information I received.

As evident from the data presented above, 195(50.5%) respondents strongly disagreed that agricultural biotechnology information has made them to inform and encourage other farmers and consumers on the benefits of the application while 184(47.5%) respondents agreed with the statement. 0.8% and 1.0% indicated 'strongly agree' and 'disagree' respectively. The mean response for the respondents was 2.48 ($\bar{x}$ = 2.48) and is below the mean decision criterion of 2.5 ($\bar{x}$ = 2.5). Hence, the statement is rejected. This means that agricultural biotechnology information has not made them to inform and encourage other farmers and consumers on the benefits of the application.

The table above reveals the responses of respondents regarding the agricultural biotechnology information has made them to have interest in its made crops and animals preference of agricultural biotechnology in farming. Among the response options, respondents who indicated 'disagree' were in the majority 221(57.3%) while those who indicated 'strongly agree' were in the minority 5(1.3%). The mean response of the respondents was 2.10 and is below the mean decision criterion of 2.5. This meant that the statement was rejected by majority of the respondents.

From the table above, 198(53.7%) respondents strongly agreed that agricultural biotechnology information has not been well adopted by farmers in the state. 176 respondents representing 45.5% disagreed with the statement, 7(1.8%) respondents indicated 'agree' and 5(1.3%) respondents indicated 'strongly disagree'. The mean response for the respondents was 2.74 ($\bar{x}$ = 2.74). Since this is above the acceptance criterion 2.5 ($\bar{x}$ = 2.5). The statement is accepted. This implies that agricultural biotechnology information agricultural biotechnology information has not been well adopted by farmers in the state.

The grand mean value of the computed means (2.37, 2.24, 2.41, 2.36, 2.48, 2.10 and 2.74) in research question four was 2.33($\overline{\overline{X}}$ = 2.98). This shows that majority of the respondents agreed that farmers' attitude towards the implementation of agricultural biotechnology information was poor due the reservations they had about the new agricultural method.

DISCUSSION OF RESULTS

The discussion of findings was based on the outcome of data collected and analyzed. On the level of famers' exposure to agricultural biotechnology information, the result shows that majority of the respondents were moderately exposed to agricultural biotechnology information and have observed that agricultural biotechnology information is geared towards improving agricultural

production. The result further revealed that majority of the respondents (215 or 58.3%) strongly disagreed on information about growing of genetically modified crops and animals, production of food based using agricultural biotechnology.

This finding reveals that majority of the respondents had been moderately exposed to agricultural biotechnology information. This finding equally supports that of Okoroma, Nnadi, Anaeto, Echetama, Uche-Nwachi, and Anaeto *(2015*) on utilization of information and further on Gidado (2024) an era where misinformation spreads faster than facts, science journalism has emerged as a crucial force in shaping public understanding of complex subjects. Nowhere is this more evident than in the field of agricultural biotechnology in Nigeria. The recently concluded 2024 OFAB Nigeria Media Awards, held in Abuja, underscored the media's vital role in shaping the discourse around biotechnology.

The findings on the kind of information that is available to respondents on agricultural biotechnology showed that majority of the respondents (189 or 50.3%) agreed that agricultural biotechnology information is about animal and crop improvement as a focus; that agricultural biotechnology information is about the introduction of new crops and animal spices and that agricultural biotechnology information is aimed at clearing negative views about agricultural biotechnology application in farming (244 or 64.9%). The findings further showed that majority of the respondents agreed that agricultural biotechnology information content is on assurances of producing healthy genetically modified crops and animals as well as making agricultural produce resistant to pests and diseases.

Further findings from the table shows that majority of the respondents (281 or 72.8%) strongly agreed that agricultural biotechnology information content reveals the support of stakeholders on agricultural biotechnology. These results show that majority of the respondents agreed that information contents they received on agricultural biotechnology were moderately on the introduction of new and genetically modified animal and crop species, health and resistant to pests and diseases as well as trust safety and support of experts and stakeholders of agricultural biotechnology. Mustapha (2023) hints that Nigeria is getting poorer and the agricultural environment is getting worse. Low-performing, out-of-date, and incompatible with the new climatic conditions, seed varieties. Diseases and insect pest pressure is strong. Low soil fertility and a lack of investment capital are two problems hence appropriate kind information and communication is needed.

This finding is in the same direction with Kamau (2012). He says becoming aware of an issue is necessary, yet not sufficient, to become informed or take action on the topic. To do so also requires that an issue becomes salient and for an issue to become salient, it must be covered with high frequency over a period of time. This is clearly in line with the findings of this study.

On the farmers' attitude towards the implementation of agricultural biotechnology information, majority of the respondents representing 244 (64.9%) disagreed on the acceptance of agricultural biotechnology in their farming. It was found that majority of the respondents disagreed with information on acquiring genetically modified products. It was further observed that the overwhelming majority of the respondents had negative and attitude towards the application of agricultural biotechnology method in farming and marketing of agricultural biotechnology products, interest in the consumption of genetically modified agricultural product as well as preference of agricultural biotechnology method in farming.

The finding of this study is in concurrent with Ogunsumi's (2011) finding that farmers had showed negative attitude towards improved technology like agricultural biotechnology. While Karembu and Nguthi (2011agrees on the need for communicating agricultural biotechnology in Africa through radio, Mustapha (2023) observes that in order to overcome these obstacles and increase food production for the general public, it is crucial to investigate flexible tactics and cutting-edge technological tools like modern biotechnology. Modern biotechnology practices, which use genetic modification tools, will provide safer, cheaper, better quality, less waste, less energy, more environmentally friendly and more sustainable products.

CONCLUSION

Based on the findings of this study, the researcher concluded that communicating farmers on agricultural biotechnology centered on dissemination relevant information on the developments, updates and innovations available in the farming system. It is made to create adequate awareness, educate and sensitize the farmers on the nature, application and benefits of its adoption in agricultural production and as well clear the existing doubts, misconceptions and arguments against it has not been adequately done. This is because majority of the farmers were mainly exposed to the information through the agricultural extension agents and the mass media during their farmers' cooperative societies meeting and in their resting hours in their houses respectively.

The researcher further concluded that poor and inappropriate information dissemination of agricultural biotechnology to farmers on farming has negatively affected the level of its adoption by farmers. This has consequently affected the required attitude of farmers towards the use of the messages received on agricultural biotechnology and as such, communication on agricultural biotechnology has not been effective and thus, has not produced the required response/result to the farmers in Ebonyi state.

Recommendations

Based on the findings of the study, the following recommendations were made:

1. The study recommends for regular communication with farmers in Ebonyi State on the nature and application of agricultural biotechnology through various mass and social media outlets and platforms so as to increase farmers' exposure and knowledge on it.
2. Agricultural Development Agencies such as Agricultural Transformation Agenda (ATA), International Institute for Tropical Agriculture (IITA), FADAMA 111 among others in Ebonyi State should communicate Ebonyi farmers on simple and affordable or applicable agricultural biotechnology devices, innovations and products.
3. Journalists specialized on agricultural reporting should partner with Agricultural Development Agencies to carry out mass media campaigns on agricultural biotechnology should be designed with local language, contents and settings that would enable farmers' participation for acceptance and application of agricultural biotechnology information to their farming practices.

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