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*Full Length Research Paper*

# Strategies used by Agricultural Extension Service Providers in Generation and Dissemination of Agricultural Biotechnology to Rural Farmers in Imo State, Nigeria

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**ABSTRACT:** Agricultural biotechnology has significantly improved food, feed, and fiber production. The need for improved strategies for transferring the benefits of biotechnology to end users, particularly in rural areas, has been a major challenge. A study was begun to investigate the strategies used by agricultural extension service providers in disseminating the effectiveness and impact of agricultural biotechnology to rural farmers in Imo State, Nigeria. Through the use of a well-structured questionnaire and group interview, data were gathered from 120 respondents, including researchers, extension agents, and rural farmers. They were then subjected to descriptive statistics like percentage, frequency, and mean. To choose respondents, a multi-stage random sampling technique was used. The findings showed that individual, group, and mass contact methods were the most frequently employed by agricultural extension services. These methods involved giving end users demonstrations of biotechnology products. Improved connections between the public and private sectors involved in agricultural biotechnology, including involving rural farmers in biotechnology research and development had a positive impact on the strategies. Researchers, extension staff, and farmers all concur that enhanced extension services built on sound strategies present a significant opportunity for knowledge sharing, knowledge improvement, technology skill development, risk reduction, and improvement of farm management practices related to agricultural biotechnology.

**Keywords**: Agricultural extension, Biotechnology communication, and Agricultural biotechnology

## INTRODUCTION

Agricultural biotechnology is the bedrock that has the greatest potential to contribute to crop productivity gains and crop improvement for Nigeria's smallholder farmers, producers, and consumers. Biotechnology is thus the only novel approach capable of changing the face of agriculture in order to meet the increasing and varying needs while also meeting the challenges in agricultural production for food, livestock feed, and fiber (Penn, 2003).

It employs life sciences, chemical sciences, and engineering sciences to achieve and improve technological applications of the capabilities of living organisms and their derivatives in order to produce products of value to farmers and society. The primary goal of agricultural biotechnology is to produce rapid multiplication of useful microorganisms, plant micro propagation, diagnostic tools for crop disease identification, high yielding and disease resistant crops, and improved production efficiency in animal husbandry (FAO 2004; Wheeler, 2005).

Other branches of agricultural biotechnology include genomics (the mapping of an entire organism's genome) and bioinformatics (the computer processing of massive amounts of genetic data) (Glover, 2001). The role of biotechnology generation systems and technology transfer systems in agriculture is equally important. Traditionally, technological innovations are disseminated

through three methods: personal contact, group contact, and mass contact via result and method demonstration methods.

Dissemination of agricultural biotechnology research findings is essential for enabling farmers to apply trustworthy agricultural knowledge. No matter how promising agricultural biotechnology and information may be, for it to be useful it must reach farmers through agricultural extension (Lucky and Achebe, 2013). Agricultural extension provides researchers with feedback on the efficacy of new technologies as well as with farmers' needs and accurate, unbiased information on biotechnology (Davis et al., 2004; Anderson and Feder, 2004).

Any agricultural technology that is to be adopted by farmers must go through the adoption process (awareness, interest, evaluation, trial and finally adoption). All of this is being disseminated by agricultural extension through proper channels. Dissemination strategies aim to disseminate agricultural biotechnology knowledge and the associated evidence-based interventions on a large scale within or across geographical locations, practice settings, social or other networks of end users such as farmers. A good information dissemination source must be relevant, timely, accurate, cost effective, reliable, and usable on an aggregate level by rural farmers for adoption.

According to Lucky and Achebe (2013), researchers, agricultural extension agents, knowledgeable farmers, research institutions, mass media commercials, and government agencies are some of the people who disseminate information and strategies to farmers for on-farm activities. According to a study by Annune et al. (2014), market places, friends, and neighbors are useful resources for informing rural farmers about agricultural research and biotechnology. Between 40 and 70% of farmers indicated that agricultural extension was a crucial source of information for their farming activities, according to Ndungu et al. (2000). Farmers, producers, and consumers around the world—including those in Imo State—have benefited from the use of biotechnology in agriculture. Extension service providers have a responsibility to increase farmers' knowledge of the advantages of using biotechnology products, better seeds, appropriate fertilizer use, and new agronomic practices.

The crop productivity of smallholder farmers will be extremely low due to the absence of all these factors, but with the introduction of agricultural extension strategies in generation and dissemination through addressing and enhancing capacity for agricultural biotechnology system and through identification and training of rural farmers on the need to use bio fortified crops.

Many smallholder farmers in the study area are now benefiting from biotech crops such as cassava, sweet potato, and maize for food security and nutrition.

Agricultural extension strategy thus includes technology transfer, advisory work (persuasive and participatory), human resource development, and empowerment facilitation. So, what are the strategies employed by extension services in the generation and dissemination of agricultural biotechnology? What are the alleged advantages of agricultural biotechnology? Thus, the study's goal was to determine the strategies used by agricultural extension service providers in the generation and dissemination of agricultural biotechnology in Imo state, Nigeria, as well as the perceived benefit of agricultural biotechnology.

## MATERIALS AND METHODS

The study was carried out in Imo State Nigeria. Imo State has population of about 2,485,799 people, made up of 1,178,331males and 1,307,468 females (NPC, 2006), with population density of 449 males and 256 females per square kilometer respectively. A multistage random sample procedure was used for the study. The two agricultural zones (Okigwe and Owerri) were chosen in the first stage. In the second stage 2 communities were purposively selected from each of the zones given a total of 4 communities. In the third stage 3 communities were randomly selected from each of the selected communities to give a total of 12 communities. Then, using a well-structured questionnaire, 10 contact farmers were chosen at random from the list of farmers, for a total of 120 farmers used in the study. Descriptive statistics such as frequency distribution tables, percentage, mean, and multiple regression analysis were used to analyze the data collected.

### Data analysis

Through the use of a questionnaire and a structured interview schedule, information for the study was gathered from the respondents. A list of potential agricultural extension service strategies was given to the respondents on a 4-point Likert type scale with response options (strongly agree = 4; agree = 3; disagree = 2; and strongly disagree = 1) in order to determine the methods employed by extension service providers in the creation and dissemination of agricultural biotechnology. The likert scale value were added up to get 10 and then divided by 4 to arrive at the benchmark mean score of 2.5. Any variable with a mean score of 2.5 or more was regarded as having an expected role for agricultural extension services in the development and dissemination of agricultural biotechnology, whereas variables with mean scores below 2.5 were not thought to have such a role.

To determine the anticipated benefits of agricultural

**Table 1:** Distribution of respondents according to their agreement on the strategies used by agricultural extension service providers in dissemination of biotechnology.

| Strategies used by agricultural extension | Strongly agree | Agree | Disagree | Strongly disagree | Mean |
|---|---|---|---|---|---|
| Face to face briefing/individual method | 43 | 53 | 11 | 13 | 3.20 |
| Group contact method | 31 | 37 | 20 | 30 | 3.10 |
| Mass contact method | 74 | 35 | 8 | 3 | 3.50 |
| Uses demos for dissemination of improved desirable traits of biotechnology products | 10 | 22 | 25 | 62 | 1.82 |
| Capacity building and training work shop on communication and biotech education | 7 | 13 | 63 | 37 | 1.96 |
| Uses mass training method to ensure adoption of biotechnology and food production | 35 | 47 | 18 | 20 | 2.81 |
| On- farm research on farmers field | 28 | 31 | 41 | 20 | 2.56 |

Source: Field Survey 2019

**Table 2:** Distribution of Respondents According to Perceived Extension Roles in Dissemination of Agricultural Biotechnology.

| Extension roles | Strongly agree | Agree | Disagree | Strongly disagree | Mean |
|---|---|---|---|---|---|
| Developing the appropriate mechanisms to transfer the research findings on agricultural biotechnology | 36 | 35 | 8 | 3 | 3.50 |
| Involvement of end-users (farmers) to participate in issues relating to biotechnology research and development. | 63 | 37 | 10 | 10 | 3.30 |
| Educating the end users to adopt the new innovation in order to achieve food security | 36 | 40 | 43 | 1 | 3.10 |
| Equipping the farmers with managerial skills through informal education and demonstrations to sustain proven biotechnology | 63 | 33 | 10 | 14 | 3.21 |
| Provision of soft loan to farmers | 10 | 22 | 25 | 62 | 1.85 |
| Increase farmers' household production through dissemination of desirable traits of biotechnology products | 41 | 36 | 34 | 9 | 3.20 |
| Incorporate other rural development agencies to influence farmers in food production. | 7 | 13 | 63 | 37 | 1.92 |

Source: Field Survey 2019

biotechnology, a list of potential benefits was presented on a 5-point Likert type scale with response options (to a great extent = 5; to some extent = 4; to a little extent = 3; to a very little extent = 2; to no extent = 1).The likert scale value were added to get 15, and then divided by 5 to get a mean score of 3.0, which serves as the benchmark. Any variable with a mean score equal to or greater than 3.0 was considered a benefit of agricultural biotechnology, whereas any variable with a mean score less than 3.0 was not considered a benefit of agricultural biotechnology.

## RESULTS AND DISCUSSION

The results in (Table 1) show the various strategies used by agricultural extension service providers in disseminating desirable biotechnology to rural farmers. Each strategy's average scores were calculated. The study found that agricultural extension service providers use group contact methods to effectively disseminate biotechnology to rural farmers, with a mean score of 3.50, capacity building and training workshops with a mean score of 1.96, mass training methods to ensure adoption of biotechnology for food production with a mean score of 2.81, and face-to-face or individual methods with a mean score of 3.20. (2.56). Two strategies, however, were rejected by farmers with a mean score of less than 2.5.

The results in (Table 2) show the perceived extension roles in agricultural biotechnology dissemination to rural farmers. Creating appropriate mechanisms for transferring agricultural biotechnology research findings (3.50), Participation of end-users (farmers) in biotechnology research and development (3.30), Education of end-users to adopt new innovations in order to achieve food security (3.10).

Equipping farmers with managerial skills through informal education and demonstrations to sustain proven biotechnology (3.21), providing farmers with soft loans (1.85), increasing farmer household productivity through dissemination of improved desirable traits of biotechnology products (3.20), and incorporating other rural development agencies to influence farmers in food production (1.92). According to Davis et al. (2004) one potential strategy for informing diverse audiences about agricultural biotechnology is public enlightenment through formal education.

If this is the case, extension must take a proactive leadership role and develop innovative strategies to address the issue of transferring research findings on agricultural biotechnology and educating end users to adopt biotechnology innovations.

**Table 3:** Distribution of respondents according to their expectation and perceived benefit from agricultural biotechnology.

| Perceived benefit | To | some extent | To a little extent | To a very little extent | To no extent | Mean |
|---|---|---|---|---|---|---|
| Increased productivity | | 63 | 33 | 10 | 14 | 3.21 |
| Improved resistance to pest and diseases | | 74 | 35 | 8 | 3 | 3.50 |
| Increased yield | | 74 | 37 | 10 | 10 | 3.30 |
| Improve nutritional quality of staple food crops | | 36 | 41 | 30 | 13 | 3.10 |
| Developed low cost disease free planting material | | 43 | 41 | 13 | 23 | 2.87 |
| Energy usage on biotechnology crop is lower. | | 21 | 12 | 42 | 45 | 2.10 |
| Increase financial returns to farmers | | 36 | 41 | 9 | 34 | 3.20 |

Source: Field survey 2019

Table 3 depicts the rural farmers' expectations and perceived benefits of agricultural biotechnology products. Among these advantages are increased productivity (3.21), improved resistance to pests and diseases (3.50), increased yield (3.30), improved nutritional quality of staple food crops (3.10), low-cost disease-free planting material (2.87), very low energy usage on biotechnology crops (2.10), and increased financial returns to farmers (3.20).

This implies that farmers anticipate that any technology will increase productivity, improve nutritional quality, and improve their livelihood. Thus, agricultural biotechnology research and development is foundational, with the potential of such novel approaches capable of changing the face of agriculture in order to meet the increasing and varying needs of rural farmers (Penn, 2003).

## Conclusion and Recommendation

Traditionally, the role of agricultural extension has been to provide clients with research-based information on agricultural issues. The purpose of this paper is to investigate the various strategies employed by agricultural extension service providers in the generation and dissemination of agricultural biotechnology to rural farmers in Imo State, Nigeria. According to the study's findings, agricultural extension services play an important role in providing researchers with information on farmers' needs and in equipping farmers with skills through informal extension education and demonstration. According to the evidence gathered in this study, individual, group, and mass contact methods were the primary sources and channels of disseminating biotechnology in the area of study. Indeed, mass contact was discovered to be the most preferred and used source and channel of information by farmers due to its ease of reaching large audiences. Agricultural Extension is the only empowering system for sharing information, knowledge, technology, skills, risk management, and farm management practices across agricultural subsectors and along the entire agricultural supply chain. As a result, demonstration farms on farmers' fields in the area should be recommended to aid dissemination, as should mass training and retraining of both farmers and extension service providers.

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