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Crop Farmers' Participation in Research and Extension Programmes in Ogun State, Nigeria

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Abstract

This study assessed crop farmers' participation in research and extension programmes in Ogun State, Nigeria. Data were obtained from randomly interviewing 160 registered crop farmers, 10 subject matter specialists, and 40 extension workers. The data were analysed using percentages, charts, and an ordered logit model. Results showed that 69.2% of the crop farmers participated mostly in community-based agricultural and rural development programmes. Insufficient funds to conduct research and extension programmes ($\bar{x} = 4.96$) and brief period allocation for training ($\bar{x} = 4.94$) were the major factors affecting crop farmers' participation in research and agricultural extension programmes. The major perception of the crop farmers was that research and extension programmes had boosted production capacity ($\bar{x} = 2.92$). When crop farmers participated in research and extension programmes, the extension agents' main assessment was that the relationships among the farmers had improved ($\bar{x} = 2.48$). Crop farmers' participation in research and extension programmes was significantly influenced by age ($\beta = 0.61$), training experience ($\beta = 0.34$), education ($\beta = 0.32$, $P < 0.05$), and access to extension services ($\beta = 0.71$). The focus of crop farmers' involvement in research and extension initiatives should be redirected from rural development initiatives to national food programmes.

Keywords: Crop farmers, extension programmes participation, perception of extension agents, perception of crop farmers.

Introduction

Crop production is a widely used agricultural technique by farmers all over the globe to cultivate and obtain crop yields for use as food and fibre. This method covers all of the food sources needed to sustain and yield crops (Pushpalatha & Byju, 2022). Among the techniques used in crop production include soil preparation, seeding, irrigation, applying manure, fertilizer, and pesticides to the crops, harvesting and safeguarding the crops, and storing and conserving the finished products. Harvesting

and storing crops are the latter phases of agricultural production (Pushpalatha &Byju, 2022).

However, the majority of crop growers in many developing nations have not received adequate attention from agricultural services because farmers or farmer groups have not participated in agricultural extension programmes and activities. Among the many difficulties facing agricultural extension is the non-participation of clients in the creation of agricultural programmes and extension initiatives (Kamara *et al.*, 2019; Benyam *et al.*, 2021). The majority of this group consists of small-scale, resource-poor, subsistence crop farmers whose farm output falls short of what is produced in farm trials and experimental stations. Low educational attainment, ineffective agricultural methods, lack of technological connections between research and production, and most importantly-farmers' little involvement in research and extension activities are the causes of this.

According to Talukder *et al.* (2020), participation refers to the crop growers' involvement in decision-making through cooperation and contact with agricultural organizations. This involves genetic enhancement, enhanced plant protection, irrigation, storage methods, mechanized farming, efficient marketing, and enhanced resource management with the aim to increase agricultural output and quality. People have varied interpretations of what they mean when they say "participation." In a social context or structure, it involves collaborating with others to establish reasons for acts and make value judgments. To support fellow men's bodily and mental requirements, participation is a process that combines a man's knowledge and vision (Kalogiannidis *et al.*, 2022).

Despite having similar objectives, there is not enough collaboration between extension and research since, for the most part, these services were not designed with complementarities in mind. Through better preservation of plants, irrigation, storage methods, farm mechanization, efficient sales, and genetic enhancement, crop productivity and quality can be increased. Extension, which applies new knowledge and scientific research to agricultural practices through farmer education, can help achieve these goals (Adamsone-Fiskovica & Grivins, 2022).

An efficient extension system is crucial for educating crop farmers about improved technologies and encouraging their adoption. Without it, these farmers would not have been aware of or had access to these improved technologies on their own. Good extension services are a major factor in encouraging this adoption, affecting farm revenue and production (Neza *et al.*, 2021). Nevertheless, not all farmers have access to these resources, and this may be attributed to a variety of variables, including the farmers' degree of program involvement (Emeana *et al.*, 2019).

Various foreign funders, such as the World Bank and different organizations, have financed numerous extension intervention programs in Nigeria (Ankrah & Freeman, 2022). The following are some of the extension intervention programs that the States have implemented: United States Agency for International Development (USAID), Africa Cassava Agronomic Initiative (ACAI), Commercial Agricultural Development Project (CADP), African Development Foundation, International Fund for Agricultural Development (IFAD), Root and Tuber Expansion Programme (RTEP), National Programme for Food Security (NPFS), FADAMA II, Nerica rice production, and the Community-based Agricultural and Rural Development Programme (CBARDP). The

degree of engagement by farmers in each scheme has varied. However, the Research-Extension-Farmer-Input Linkage System (REFILS) is the umbrella organization that oversees all of the research and extension initiatives of the Agricultural Development Programmes (ADPs) in Nigeria.

Farmers participating in research and extension have several benefits, including increased acceptance of new technologies, higher adoption rates, and the promotion of innovation and farmer control (Olum et al., 2020). Additionally, it's a chance to promote connections and foster mutual learning amongst the many players, including farmers, extension workers, and researchers. It guarantees farmers' responsiveness, strengthens their ability to consider, evaluate, and act, and enhances the relationship between the state and civil society. Additionally, it creates responsibility for stakeholders, fosters transparency, and helps achieve equity goals, that is, the equitable allocation of resources enhances performance by using development lessons to boost the production of project farmers.

In Nigeria, agricultural research has a somewhat lengthy history that dates back to 1893 (Abbas, 2019). Despite this, the previously expected outcome has not been completely achieved despite significant expenditures in both people and material resources. Therefore, it is necessary to measure the crop farmers' participation in research and extension programmes in Ogun State, Nigeria. Therefore, this study is expected to achieve the following objectives:

1. Identify agricultural extension programmes that are available;
 2. Identify factors affecting the participation of crop farmers in research and extension programmes;
 3. Determine the perception of crop farmers towards research and extension programmes;
 4. Determine the perception of extension agents towards crop farmers' participation in their programmes; and
- Itemize benefits of crop farmers' participation in research and extension programmes

Methodology

Ogun State of Nigeria, with a land mass area of 16,406,226 km², is located between latitudes 7° 01' and 7° 18' and longitudes 20° 45' and 30° 55' (Britannica, 2022;). Four zones make up the Ogun State Agricultural Development Program (OGADEP) are Abeokuta, Ilaro, Ikenne, and Ijebu. Out of 18 blocks that comprise all the four zones, four blocks were chosen for the study, one from each of the four zones. Thirdly, out of 26 extension cells from the selected blocks, 16 cells were chosen randomly. Based on the above analysis, 10 subject matter specialists out of 12 SMSs, and 40 extension workers out of 68 Extension Agents, and a total of 160 crop farmers from the lists of farmers (3,288 crop farmers) were picked at random. The total sample size for the study was 210 respondents.

A questionnaire, a structured interview guide, in-person discussions, and observation were used to gather data for the study. The research was carried out between September 2022 and January 2023. The data were described and analyzed using charts, ordered logit model, mean, and percentage.

With a response of "aware" or "not aware," the study comprised the current agricultural extension programmes that are offered in the study region. A 5-Likert-type scale was used to quantify the factors influencing crop farmers' engagement in research and extension programmes. The scale of strongly affected = 5, affected = 4, moderately affected = 3, less affected = 2, and not affected = 1 was used. The grand mean is 4.01; therefore, with mean values less than 4.01, crop farmers' engagement in research and extension programmes was impacted by low factors. The perception of crop farmers towards research and extension programmes, the grand mean is 2.88, a mean value that is either equal to or higher than the grand mean is regarded as "high or favourable perception statement and otherwise is considered a "low or unfavourable perception statement". Also, the perception of extension agents towards farmers' participation in their programmes were determined on a 3-point Likert-type scale of high = 3, fair = 2, and Low = 1. The grand mean is 2.25, a mean value that is either equal to or higher than the grand mean is regarded as "high or favourable perception statement" and otherwise is considered a "low or unfavourable perception statement". The last section expressed the benefits of crop farmers' participation in research and extension programmes; which was measured on a 3-point Likert-type scale of High benefits = 3, Fair benefits =2, and Low benefits = 1.

Table 1: Factors affecting crop farmers' participation in research and extension programmes

Variables	Measurement	a priori signs
Dependent Variable		
Factors affecting the participation	Not affected = 1, Less affected = 2, Moderately affected = 3, Affected = 4 & Affected = 5 to justify their participation.	
Explanatory variable		
Age	Measured at the respondent's true age in years	-
Sex	Measured as a dummy variable! = Male, 2 = Female	+/-
Marital status	Single = 1, married = 2 divorced = 3, widowed = 4, separated = 5.	+/-
Level of education	No Formal Education =1, Primary Education =2, Secondary Education =3, Tertiary Education = 4	+
Household size	Number of people residing with the crop farmer	+
Participation in services of extension	Yes= 1, Otherwise = 0	+
Farm size	The area of farmland used for growing crops, expressed in hectares (Ha)	+
Annual income	Measured as the yearly net sales of produce and crops realized in Nigerian money (₦)	+
Training experience	Training received from various interventions for years	+/-
Farming experience	Measured in years	+/-

The ordered logit model used in the study is based on equation (1):

$$y_i^* = \beta' X_i + \epsilon \dots\dots\dots(1)$$

Where y_i^* is the unobserved measure of the impact of factors affecting the participation of crop farmers in research and extension programmes (dependent variables), X_i is the vector of independent variables ($i = 1 \dots n$), β' is the vector of regression coefficient to be estimated, and ϵ is the error effect.

Results and Discussion

Existing Agricultural Extension Programmes and Research

Results in Table 2 show the various agricultural extension programmes and research established with the awareness and participation of the crop farmers, to boost their crop productions. The results revealed that 69.2% of the crop farmers were aware and participated in the Community-based Agricultural and Rural Development Programme (CBARDP) sponsored by the Federal Government of Nigeria and the World Bank, Followed by 62.0% that were aware and participated German Agency for International Cooperation (GIZ) – Sedin’ activities that mainly involved good agricultural practices and farmer business school. Also, about 49.0% were aware of and participated in the Africa Cassava Agronomic Initiative (ACAI) and the United States Agency for International Development (USAID) respectively. Due to counterpart sponsors (Ogun State Government, Federal Government of Nigeria, World Bank, and United Nations) funding these intervening agencies to carry out their activities and frequently tailoring the developments to crop farmers' needs, crop farmers may be more involved in these spelled agricultural extension programmes and researches. These agricultural extension programmes and research attempt to reduce rural poverty, crop farmers' vulnerability and to ensure sustainable development in their productions (Sahya *et al.*, 2021; Philip & Lindsay, 2021).

The results further revealed that there was low awareness and participation by the crop farmers in the Root and Tuber Expansion Programme (RTEP) (25.0%), FADAMA II & III (20.5%) and National Programme for Food Security (NPFS) (6.7%). The low involvement of these crop farmers may be related to the viability of the programmes and insufficient funding from the counterpart sponsors, since it would become more challenging for these intervening agencies to carry out their operations in the research area.

Table 2: Agricultural extension programmes and research

** Programmes and Research	Percentage (%)
Community-based Agricultural and Rural Development Programme (CBARDP)	69.2
German Agency for International Cooperation (GIZ)- Sedin	62.0
Africa Cassava Agronomic Initiative (ACAI)	48.6
United States Agency for International Development (USAID)	48.6
International Fund for Agricultural Development (IFAD)	46.7
African Development Foundation	39.2
Cassava Adding Value for Africa (CAVA)	34.2
Root and Tuber Expansion Programme (RTEP)	25.0
FADAMA II & III	20.5
National Programme for Food Security (NPFS)	6.7

Multiple responses, **Source: Survey, 2023

Factors Affecting Participation of Crop Farmers in Research and Extension Programmes

Table 3 depicts the factors influencing crop farmers' involvement in research and extension programmes. Crop farmers showed the greatest factor of participation as

insufficient funds to carry out a particular research and extension programmes based on stakeholders involved ($\bar{x} = 4.96$), followed by the brief period allocated to training farmers about research and extension programmes ($\bar{x} = 4.94$) inappropriate curriculum designed for research and extension programmes ($\bar{x} = 4.85$) and language barrier between farmers and research/extension agents ($\bar{x} = 4.81$). The results indicate that research and extension programmes that are devoid of sufficient funds, longer allocated periods in training, cleared programme curriculum design, and disseminating language would attract more crop farmers to participate in research and extension programmes which invariably allow them to pass necessary information about improved technologies and innovations gained to their fellow farmers as this will postulate positive effects on their crop production.

Inversely, factors that were considered as low for crop farmers in participating in research and extension programmes thus were; programmes tally not with their needs ($\bar{x} = 2.24$), and the inability of a vulnerable individual or low calibre of farmers to participate in research and extension programmes ($\bar{x} = 1.86$). Low participation may be the result of ignorance or inefficient means for delivering or spreading the services (Shangshon, *et al.*, 2023). Crop farmers' involvement in research and extension programmes is influenced by factors such as programme's accessibility, relevance, diversity, and information transmission methods and technology (Baiyegunhi *et al.*, 2019; Kassem *et al.*, 2021). As a result, research and extension initiatives need to incorporate the advancement of knowledge, financial incentives, and efficient service delivery (Shangshon, *et al.*, 2023).

Table 3: Participation of crop farmers in research and extension programmes

Factors	Mean	SD
Insufficient funds	4.96	0.51
Brief period dedicated to training	4.94	0.42
Unsuitable curriculum development	4.85	0.54
Barrier based on language	4.81	0.46
Social & economic traits of farmers	4.44	0.47
Training coincides with days of market	4.42	0.56
Peer influence	4.38	0.48
Dedication of the crop farmers	4.07	0.53
Insufficient of post-training	4.05	0.49
Events during the raining season	3.98	0.51
Extension agents' dedication	3.77	0.55
Participation-related discomfort	0.0	2.86
Programme tally not with farmers' needs	65.0	2.24
Vulnerable individuals could not participate	75.0	1.86

Source: **Survey**, 2023.

Perception of Crop Farmers towards Research and Extension Programmes

The responses of crop farmers to a series of perception statements on extension and research programmes were shown in Table 4. Considered high or favourable perception statements are; research and extension programmes that had boosted production capacity ($\bar{x} = 2.92$). With this finding, many of the respondents claimed that the types of technical information they have received through different research and extension programmes have allowed them to adopt and utilize improved crop technologies and innovations that have boosted their yields. This supports the findings of Glover (2019) and Sacha, Ricardo & Amy (2021) who researched on adoption of agricultural technology in the developing world that impacted respondents' yields.

In addition, research and extension programmes boosted the knowledge, education, and employment of the respondents ($\bar{x} = 2.92$), also increased their scientific application know-how ($\bar{x} = 2.92$) in the area of their crop production and provided opportunities for learning and skill development ($\bar{x} = 2.90$). This suggests that in order to boost crop productivity, research and extension programmes have helped and improved farmers' knowledge and abilities regarding crop types, genetic modification, plant protection, seed storage, and irrigation (Mesterházy *et al.*, 2020). On the other hand, the perception that is considered low about research and extension programmes was; that research and extension programmes encouraged interaction and relation between crop farmers ($\bar{x} = 2.48$) as well as gave crop farmers high-quality information ($\bar{x} = 2.48$) about marketing and business. This indicates that research and extension programmes have developed economically viable ways to increase crop output in addition to greatly increasing the value of improved farming techniques.

Table 4: Perception of crop farmers towards research and extension programmes

Perception Statements	Mean	SD
R & EPs boost production capacity	2.92	0.26
R & EPs boost employment, education, and knowledge	2.92	0.26
R & EPs convey scientific farming advice	2.92	0.26
R & EPs provide opportunities for learning & skill development	2.90	0.45
R & EPs boost the self-esteem of crop farmers	2.87	0.31
Producing crops with R & EPs is generally more efficient	2.84	0.22
R & EPs encourage interactions and relationship	2.48	0.43
R & EPs give farmers high-quality information	2.48	0.43

Source: **Survey**, 2023. Grand mean = 2.88.

Perception of Extension Agents towards Crop Farmers' Participation in their Programmes

Results in Figure 1 revealed the reactions of extension agents and subject matter specialists to a set of perception statements toward crop farmers' participation in their programmes. Considered high or favourable perception statements are; participating in research and extension programmes had improved association or relationship ($\bar{x} = 2.48$), self-awareness $\bar{x} = 2.46$), new skills ($\bar{x} = 2.46$), and participatory approaches ($\bar{x} = 2.30$) of the crop farmers. This finding suggests that the functional engagement of farmers should be the minimum need for extension and research if sustainable development is the desired outcome. Participation of farmers in research and extension activities has a lot of benefits which include the promotion of innovation and ownership of the farmers, the increase of adoption rates, and the acceptability of new technologies (Sacha, Ricardo & Amy, 2021).

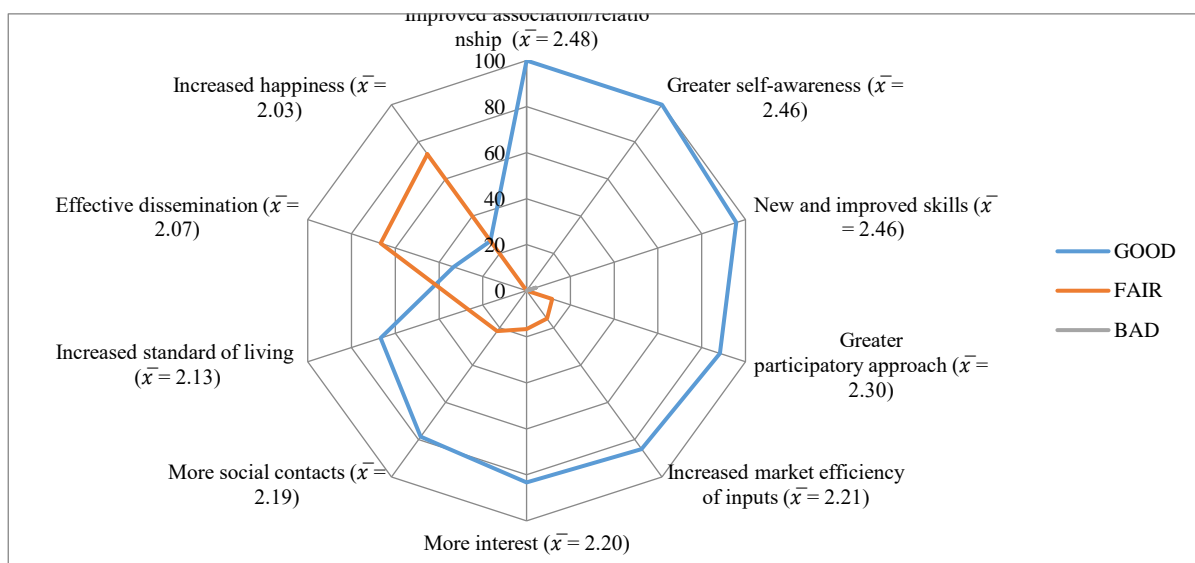


Figure Figure 1: Extension agents' perception towards crop farmers' participation in their programmes. Source: Survey, 2023.

Benefits of Crop Farmers' Participation in Research and Extension Programmes

The results in Table 5 show that crop farmers highly benefitted in gaining more learning and skill development ($\bar{x} = 3.00$), use of chemical and biological applications in crop production ($\bar{x} = 3.00$), self-awareness among them ($\bar{x} = 3.00$), effective weed management ($\bar{x} = 3.96$) and utilization of enhanced crop varieties after participating in research and extension programmes. The methods used to deliver extension services, the system's governance, capacity, and administrative structures, as well as fundamental contextual factors play a significant role in how well the extension system and research promote capacity building, technological implementation, and ultimately increase crop production (Takahashi *et al.*, 2020). The development of scientific understanding of new technologies and manufacturing efficiency also makes these necessary (Takahashi *et al.*, 2020). On the other way round, genetic modification ($\bar{x} = 1.86$) and increased knowledge in biotechnology ($\bar{x} = 1.95$) were considered as low benefits towards crop farmers' participation in research and extension programmes.

Table 5: Benefits of crop farmers' participation

Benefits	Mean	SD
Enhanced learning and skill development opportunities for crop farmers	3.00	0.12
Increased use of chemical and biological sciences in agriculture	3.00	0.12
A higher level of self-awareness among crop farmers	3.00	0.12
Effective weed management	2.96	0.25
Enhanced productivity of farmers in agriculture	2.91	0.19
Utilization of enhanced crop varieties	2.88	0.22
Better control of water resources	2.15	0.17
Effective eradication of crop diseases or pests	2.12	0.19
Increased knowledge of biotechnology	1.95	0.30
Genetic modification	1.86	0.14

Source: Survey, 2023.

Relationship between the Selected Socio-economic Characteristics of Crop Farmers and Factors affecting their Participation in Research and Extension Programmes

The parameters influencing the crop farmers' participation in research and extension programs were determined by taking into account their socio-economic features. The chi-squared value of 72.32 from the ordered logit model indicates very significant likelihood ratio statistics ($P < 0.01$), showing a wide range in the factors affecting crop farmers' involvement with research and extension programmes. With a pseudo- R^2 of 0.27, it can be inferred that independent variables account for 27% of the variation in the factors influencing crop farmers' engagement in research and extension programmes. Table 4 presents results, which indicate that crop farmers' participation in research and extension programmes was influenced by age, education, training experience, and access to extension services. However, there was no significant association found between crop farmers' participation in research and extension programmes and factors such as sex, marital status, family size, farm size, and annual income.

Table 6: Socio-economic and other factors affecting the participation of crop farmers

Factors	Coeff.	S.E	Odd ratio
Intercept or Constant	0.62	0.10	0.33
Age	0.61**	0.13	1.15
Sex	-0.09	0.24	0.71
Marital status	0.08	0.26	1.32
Level of education	0.32**	0.07	1.32
Household size	0.11	0.15	1.10
Access to extension services	0.71***	0.26	1.87
Farm size	-0.04	0.12	0.89
Annual income	0.07	0.07	1.07
Farming experience	-0.08	0.21	0.84
Training experience	0.34**	0.05	1.29
R^2	0.27		
Chi-square	72.32*		
Df	10		

** $P \leq 0.05$

Age of crop farmers

The ordered logit result demonstrates that the age of crop farmers and the variables influencing their participation in research and extension programmes have a positive and significant ($p < 0.05$) relationship. The current literature suggests that older farmers are less interested in long-term investments and are risk-averse than their younger counterparts, which conflicts with our a priori expectation and this outcome. Crop farmers have an odd ratio of more than one (1.15) for taking part in research and extension programmes. This suggests that farmers are more likely to participate in these programmes as they age by one year. Crop farmers have an odd ratio of more than one (1.15) for taking part in research and extension programmes. This suggests that farmers are more likely to participate in these programmes as they age by one year. This outcome is in line with studies by Oyetunde-Usman *et al.* (2021) which found that elderly people are more open to contemporary research and extension initiatives than younger people.

Level of education

The ordered logit result confirms that crop farmers' education and the variables influencing their participation in research and extension programmes have a positive and significant ($p < 0.05$) association. Education encourages involvement in a programme. This suggests that knowledgeable crop farmers would take part in research and extension initiatives that would benefit them, whereas less knowledgeable farmers would not, as the result is in line with the stated a priori expectation. To increase crop productivity, knowledgeable crop growers would make use of leading-edge new technologies and creative techniques. Educated crop farmers that participate in research and extension programmes will have odds ratio that are 1.32 times higher than those of non-educated crop farmers.

Extension contacts

There is a positive and substantial ($p < 0.01$) correlation between access to extension services and characteristics that influence crop farmers' involvement in research and extension initiatives. The results indicate that crop farmers' participation in research and extension programmes was highly impacted by their ability to connect with extension services. When all other factors are held constant, a one-unit increase in farmers' use of extension services was linked to 87% of the probabilities of participating in research and extension programmes. In Ogun State, there is an extension services centre on every block. These centres play a vital role in helping farmers receive knowledge, research, and innovative agricultural practices. Access to extension services has been a major factor in determining farmers' participation in research and extension programmes as well as their ability to improve agricultural output in order to take advantage of scale economies (Okello *et al.*, 2023).

Training experiences

Additionally, the significance of training experience ($p < 0.05$) was seen, and it was found to have a positive correlation with parameters influencing crop farmers' participation in research and extension programmes. This demonstrates that crop farmers participate in research and extension programmes at higher rates in proportion to their training experiences. The likelihood of taking part in research and extension initiatives rises by 29% when compared to the chances of not taking part. More training will make it more likely that respondents will take part in extension and

research programmes to acquire agricultural knowledge, expertise, and information, which will boost crop productivity (Sutherland & Marchand, 2021)

Conclusion and Recommendation

In order to improve agricultural productivity and quality, agricultural research and extension programmes often include genetic modification, improved plant protection, irrigation, storage techniques, mechanized farming, effective marketing, and improved resource management. The Community-based Agricultural and Rural Development Programme (CBARDP) and the SEDIN programmes of the German Agency for International Cooperation (GIZ) are the two agricultural research and extension programmes that are currently available and still in operation the most, according to conclusions drawn from the study's findings. This means that, in addition to programmes for rural development, research and extension agencies should have an equal focus on enhancing national food programmes.

Hence, crop farmers in research and extension programmes were predicted by inadequate funding to carry out specific research and extension programmes, a short amount of time allotted for educating farmers about research and extension programmes and inappropriate curriculum created for research and extension programmes. Therefore, this calls for research and extension initiatives that will incorporate knowledge creation linked to comprehensible communication languages, financial incentives and funding, and efficient service delivery

However, the study concluded that crop producers saw the benefits of participation in research and extension programmes as being significantly greater than genetic modification and technological expertise. Given this, research and developed extension programmes that will improve crop farmers' social interactions, standard of living, and happiness, must continue to be focused on by extension agents and researchers in order to create new and improved skills, participatory approaches, and marketing efficiency issues

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