Determinants of adoption of Deutsche Gesellschaft Für Internationale Zusammenarbeit (GIZ)-sponsored technologies among cassava farmers in Ogun State, Nigeria

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Abstract: Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) provides advisory services to cassava growers in Ogun State in order to bring about sustainable improvements in the livelihoods of participants as well as contributing to the economic development of the State. This study assessed the determinants of adoption of GIZ-sponsored technologies among cassava farmers. A total of 336 farmers (168 participants and 168 non-participants) were randomly selected from the 14 Local Government Areas where GIZ operated. Questionnaire was used to obtain primary data. Data was analysed using frequency counts, percentages, Logistic regression and χ² test. Results showed that all (100.0%) of the participants had formal education and belonged to a farmers’ association. The average farm size for participants was 1.64 hectares. The average period of participation in GIZ’s service and number of training received by the farmers were 3 years and 11, respectively. Majority of the participants (98.8%) cultivated TME 419 and local cassava varieties, respectively. Logistic regression revealed technology cost (β = 0.457), triability of technology (β = 0.493), information accessibility (β = −0.464),

ABOUT THE AUTHOR

I have been involved in evaluation studies along with my research team since 2016. The research has been mainly on the evaluation of the third sector of the Nigeria’s economy. The aim is to carefully examine the influence of this developmental partners on the rural area. This paper is a part of the study on the “Effects of GIZ-sponsored Advisory Service on Cassava Farmers’ Productivity in Ogun State, Nigeria. We are interested in ascertaining how the influence wields by the development partners is affecting the development of the rural environment. This is to enable us to suggest to the policy makers either to continue or withdraw support from them. Also, it is to enable us to suggest alternative ways, in addition to what government is doing for the development of the rural area of Ogun State and Nigeria in general.

PUBLIC INTEREST STATEMENT

The focus on rural development is rooted in agriculture’s strategic importance in development. With over 70% of the population living in rural areas, almost half in absolute poverty, the centrality of rural development to any strategy for poverty alleviation is obvious. This paper seeks to provide information on the factors that influence cassava farmers in Ogun State, Nigeria to adopt the technologies by GIZ.

Furthermore, it will feed the donor agencies with information regarding the influence they are making. Also, it could serve as an input to those agencies campaigning for rural development. This paper could be a valuable resource for policymakers in evaluating how a dynamic cassava value-chain intervention could help them to achieve their goals of poverty alleviation, economic development and food security. This study would also be of practical use to agricultural researchers, technicians and other professionals in preparing programmes for sustainable cassava production intensification.
good relationship between GIZ’s agents and farmers (β = 1.018) and government policy (β = 0.493) were the determinants (p < 0.01) of participants' involvement in GIZ’s service. It was concluded that GIZ service had positive effect. The study therefore recommends complete information on the nature, associated risks and the benefits derivable from the sponsored technologies. Also, government-friendly and GIZ-friendly policies by both the GIZ and government for the benefit of the farmers’ increased productivity is recommended.

Subjects: Agriculture & Environmental Sciences; Plant & Animal Ecology; Soil Sciences; Environment & Resources; Conservation - Environment Studies; Biodiversity & Conservation; Food Additives & Ingredients

Keywords: advisory service; determinants; economic development; participants; technologies

1. Introduction

The main objective of Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) is increased output from the same piece of land through the application of land-saving technologies. Technology is a means and methods of producing goods and services, including methods of organization as well as physical technique (Loevinsohn et al., 2012). Technology is the knowledge/information that permits some tasks to be accomplished more easily, some service to be rendered or the manufacturing of a product effectively (Lavison, 2013). Technology itself is aimed at improving a given situation or changing the status quo to a more desirable level. It assists the applicant to do work easier than he would have in its absence hence, it helps save time and labor. Adoption on the other hand is defined in different ways by various authors. Loevinsohn et al. (2012) defined adoption as the integration of a new technology into existing practice and is usually proceeded by a period of “trying” and some degree of adaptation. Adoption could also be defined as a mental process an individual passes from first hearing about an innovation to final utilization of it. It is following the extension service recommendations of using only new certified seed (Doss, 2003)

Many farmers are poor and trapped in a vicious cycle of poverty because they cultivate small areas of land from which they produce little output, and hence sell only a very small amount, which cannot help in expanding their farms, acquiring new technologies could as well be difficult, so, the cycle continues (Awotide et al., 2008). Investment in rural infrastructure lowered transportation costs, increased farmers’ access to markets, and led to substantial expansion in agricultural output. For instance, better roads reduced transaction costs of credit services resulting to increase lending to farmers, higher demands for agricultural inputs, and higher crop yields (Inoni, 2008). According to the Human Development Report (2006), efficient economic infrastructure is central to raising productivity and increasing growth in Nigeria.

The contents (technologies) of the advisory service sponsored by GIZ’s through extension agents during training sessions include but not limited to the highlights given below:

- The respondents were advised to choose exposed and a well-drained loamy soil in January. Plot where maize or legumes were previously planted preferably. Plots where cassava was previously planted should be avoided as much as possible. This is to ensure soil fertility and prevention of pests and diseases spread.
- Clearing of the plot and keeping the residues on the side of the field in heaps to dry in order to encourage nutrient recycling. This activities are to be carried out January through to March.
- Measuring the length and breadth of plot in meters (m). Multiply length with width to obtain the size in m². Divide the size in m² by 10,000 to know the size in hectare. One acre equals 4,000 m². Use of measuring tape or cord with knots. Avoid measuring with walking steps.
Output is measured in tons. One metric ton of cassava (1 ton) equals 1,000 kg. This is done for proper planning, to know the size of the plot and to measure productivity.

- Use of pesticides approved by National Agency for Food and Drug and Administration and Control (NAFDAC) and Agricultural Development Programme (ADP) agents. Label is to be read to know the correct dosage and utilization. Spraying is to be done in wind direction. Spraying should stop a month to harvest. This activity is best done May through to December. This is done to ensure plant and human health. It is also to promote environmental protection.

- Use of approved herbicides in recommended dosage and frequency; January to March. This is a weed management strategy.

- Choice of improved cassava varieties recommended by research institutes working on cassava National Root Crops Research Institute (NRCRI) and International Institute of Tropical Agriculture (IITA). Buy cuttings from certified seed dealers approved by ADP in March through to October. This recommendation is made because these improved varieties are strong against diseases and insects. Also, they produce good yield.

- Pegging the field 1 m by 1 m in March to ensure convenience and proper management of the farm.

- Heap making 30 to 40 cm high at the place of each peg for soil aeration and cassava root development. This is to be done March–April.

- One cassava cutting is to be planted per heap in slanting form to ensure good yield, two-thirds buried for early planting (Mar–Apr). The eyes (bud) of cutting turn up. Completely bury the cutting for late planting (Sept–Oct).

- Replacement of non-germinated cutting 15 to 21 days after planting to keep the plant’s original number. This is best done April–May.

- Application of mineral fertilizer eight (8) weeks after planting in ring method (NPK 15–15–15) for healthy and big cassava tubers. 600 kg (12 bags) per hectare. Fertilizer application is to be done in May.

- Harvesting is to be done 10–18 months after planting when the soil is moist. Injuries on the tuber should be avoided as much as possible to reduce spoilage and profit loss. This is best done December through July.

- Selling cassava as a group in order to get better price and income December to July.

- Savings of the major part of cassava proceed in bank for precautionary and production purpose.

- Record keeping of cash flow (i.e: money-out for input, labour and other production costs and money-in from selling cassava. Record keeping is done for proper production plan.

- Contacts (phone and address) of input dealers for networking. The linkage with research institutes and other agro-dealers is necessary to get viable inputs for cassava production

Characteristics of a technology is a precondition of adopting it. Triability or a degree to which a potential adopter can try something out on a small scale first before adopting it completely is a major determinant of technology adoption (Doss & Morris, 2001). In studying determinants of adopting Imazapyr-Resistant maize (IRM) technology in Western Kenya, Mignonoua et al. (2011) stated that the characteristic of the technology play a critical role in adoption decision process. They argued that farmers who perceive the technology being consistent with their needs and compatible with their environment are likely to adopt since they find it as a positive investment. Farmers’ perception about the performance of the technologies significantly influences their decision to adopt them.

Farm size plays a critical role in adoption process of a new technology. Farm size can affect and in turn be affected by the other factors influencing adoption (Lavison, 2013). Some technologies are termed as scale-dependant because of the great importance of farm size in their adoption
Farmers with large farm size are likely to adopt a new technology as they can afford to devote part of their land to try new technology unlike those with less farm size (Uaiene et al., 2009). In addition, lumpy technologies such as mechanized equipment or animal traction require economy of size to ensure profitability (Attah & Ejembi, 2015). Small farm size may provide an incentive to adopt a technology especially in the case of an input-intensive innovation such as a labor-intensive or land-saving technology.

The above mentioned studies consider total farm size and not crop acreage on which the new technology is practiced. Since total farm size has an effect on overall adoption. Considering the crop acreage with the new technology may be a superior measure to predict the rate and extent of adoption of technology (Lowenberg-deboer, 2000). Therefore, in regard to farm size, technology adoption may best be explained by measuring the proportion of total land area suitable to the new technology (Bonabana-Wabbi, 2002).

The cost of adopting agricultural technology has been found to be a constraint to technology adoption. For instance, the elimination of subsidies on prices of seed and fertilizers since the 1990s due to the World Bank sponsored structural adjustment programs in sub-Saharan Africa has widened this constraint (Muzari et al., 2012).

Belonging to a social group enhances social capital allowing trust, idea and information exchange (Mignouna et al., 2011). Farmers within a social group learn from each other the benefits and usage of a new technology. Uaiene et al. (2009) suggests that social network effects are important for individual decisions, and that, in the particular context of agricultural innovations, farmers share information and learn from each other.

Education of the farmer has been assumed to have a positive influence on farmers’ decision to adopt new technology. Education level of a farmer increases his ability to obtain, process and use information relevant to adoption of a new technology (Lavison, 2013; Mignouna et al., 2011; Namara et al., 2003). For instance, Okunlola et al. (2011) on adoption of organic fertilizers found that the level of education had a positive and significant influence on adoption. This is because higher education influences respondents’ attitudes and thoughts, making them more open, rational and able to analyze the benefits of the new technology. This eases the introduction of a new innovation which ultimately affects the adoption process (Adebiyi & Okunlola, 2010).

Age is also assumed to be a determinant of adoption of new technology. Older farmers are assumed to have gained knowledge and experience over time and are better able to evaluate technology information than younger farmers (Kariyasa & Dewi, 2011; Mignouna et al., 2011). On the contrary age has been found to have a negative relationship with adoption of technology. This relationship is explained by Mauceri et al. (2005) and Adesina and Zinnah (1993) that as farmers grow older there is an increase in risk aversion and a decreased interest in long-term investment in the farm. On the other hand younger farmers are typically less risk-averse and are more willing to try new technologies.

Gender issues in agricultural technology adoption have been investigated for a long time and most studies have reported mixed evidence regarding the different roles men and women play in technology adoption (Bonabana-Wabbi, 2002). In analyzing the impact of gender on technology adoption Doss and Morris (2001) had found no significant association between gender and probability to adopt improved maize in Ghana. They concluded that technology adoption decisions depend primarily on access to resources rather than on gender. On the other hand gender may have a significant influence on some technologies. For instance, a study by Obisesan (2014) on adoption of technology found that gender had a significant and positive influence on adoption of improved cassava production in Nigeria.
Acquisition of information about a new technology is another factor that determines adoption of technology. It enables farmers to learn the existence as well as the effective use of technology and this facilitates its adoption. Farmers will only adopt the technology they are aware of or have heard about. Access to information reduces the uncertainty about a technology's performance hence may change individual's assessment from purely subjective to objective over time (Bonabana-Wabbi, 2002; Caswell et al., 2001). However, access to information about a technology does not necessarily mean it will be adopted by all farmers. This simply implies that farmers may perceive the technology and subjectively evaluate it differently than scientists (Uaiene et al., 2009). Access to information may also result to dis-adoption of technology. For instance, where experience within the general population about a specific technology is limited, more information induces negative attitudes towards its adoption, probably because more information exposes an even bigger information vacuum hence increasing the risk associated with it (Bonabana-Wabbi, 2002). **Objective of the study:** The specific objective of the study is to determine the factors that influence the cassava farmers to adopt GIZ-sponsored technologies in the study area.

**Hypothesis:** There is no significant association between the farmers’ socioeconomic characteristics and the factors of GIZ’s technologies adoption.

**Statement of the problem:** The focus on rural development is rooted in agriculture, health, education and infrastructure's strategic importance in development. With over 70% of Nigeria’s population living in rural areas, almost half in absolute poverty, the centrality of rural development to any strategy for poverty alleviation is obvious. Developmental partners such as giz and other funding agencies are currently performing crucial role to provide advisory services to people living in the rural areas. They have done remarkable work in the field of literacy, family planning, environmental friendly agriculture and development of non-formal education. In this regard, it has been argued that the past poor performance of the State has led to the increased interest in NGOs and other privately organized agencies (Anderson, 2007). According to this view, State’s intervention in the economy has been marked by inefficiencies and failure of developmental programmes. After years of neglect and disinvestment in public extension, there has been renewed emphasis and shift toward private organisations offering advisory services. Within the donor community, a revitalised and expanded role for advisory and information services is seen as central to pro-poor agricultural growth. Apart from their conventional role of providing and transferring knowledge in order to increase productivity, new functions include linking smallholder farmers to high value and export markets, promoting environmental outcomes. The state operates traditional extension systems with focus on increasing agricultural production, use a top-down approach and often emphasise the transfer of technology. This model for extension, however, is becoming outdated in the more competitive, market-oriented climate of today’s agriculture. Alternative models have emerged that recognise agribusiness companies, agro-dealers, producer organisations and farmer-to-farmer exchanges, and this is what giz represent.

2. Methodology

2.1. **Study area**

This study was conducted in Ogun State (latitude 7° 00’N and longitude 3° 35’E), Nigeria. It is located in the southwest zone of the country with the total land area of 16, 409.26 square kilometres. It is bounded on the west by Benin Republic on the south by Lagos and the Atlantic Ocean, on the East by Ondo State and on the North by Oyo and Osun States. Ogun State indigene belongs to Yoruba ethnic group comprising mainly the Egba, Yewa, Awori, Eggun, Ijebu and Remo. Farming is the dominant economic activity of the people of Ogun state. The two dominant religions in the state are Christianity and Islam. A small proportion of the people still practice traditional religion. The people of Ogun state engage in one form of economic activity or another as a means of livelihood. These include trading, farming, tie and dye production, civil service, pottery and other
professional and technical occupation. Farming is the dominant economic activity of the people of Ogun state. They engage in both crop and livestock production.

The ecological climate of the State falls within the rainforest zone and partly within the southern Guinea Savannah zone. The mean annual rainfall distribution in the state is about 1300 mm. The annual rainfall varies over the years. The average temperature is 28°C and relative humidity of about 78%. The relative humidity remains uniform. The northern part of the state is mainly of derived savannah vegetation while the central part falls in the rain forest belt and the southern part belong in mangrove swamp. The geological landscape of the state comprises extensive fertile soil suitable for animal husbandry especially cattle rearing. The north-western part of the state tends toward savannah vegetation and so suitable for cattle rearing. There are also forest reserve, rivers, lagoon, rocks, mineral deposits, such as granite, limestone, kaolin, bitumen, phosphate and others. The state is blessed with respectable climate that supports cultivation of variety of crops, such as Yam, cassava, maize, plantain, vegetable and fruits. The main cash crops produced in the state are cocoa, cashew, kola nut, oil palm, rubber and coffee. The state is known to have various Agricultural Extension Programme implemented in four agricultural zones identified by Ogun State Agricultural Development Programme (OGADEP) as Abeokuta, Ilaro, Ijebu and Ikenne. Each zone comprises of block, each block is divided into circle or cells and farmers within these areas are anchored by a Village Extension Agent (VEA) who oversees their activities. The Block Extension Agent (BEA) oversees the activities of farmers in the coverage area (www.ogunstate.gov.ng).

2.2. Population, sampling frame and sample size
The target population of the study were the cassava farmers in the fourteen (14) LGAs who made up the participants and non-participants of the GIZ-sponsored advisory service in Ogun State. The sampling frame for the participants was obtained from OGADEP office. There are Forty three (43) GIZ's Extension Agent and 8,600 participants spread across the 14 participating LGAs as shown in Table 1.

2.3. Sampling procedure and sample size
Stage I: Out of the twenty (20) LGAs in Ogun State, the Fourteen (14) participating LGAs were selected namely; Ewekoro, Ijebu Ode, Ijebu North-East, Shagamu, Obafemi Owode, Ado Odo, Ogun Waterside, Ikenne, Odeda, Ipokia, Yewa North, Ife and Odogbolu.

Stage II: Using Jeff Watson (2001) sampling technique at confidence level of 95% with estimated 10% variance in population (degree of variability), a random sampling was carried out to select 168 participants for the study in a proportionate manner across the participating LGAs.

Stage III: To select for the control group, a random sampling of equal number of non-participants were selected from the same participating LGAs. A total of 168 non-participants were also selected across the LGAs. The selection was done by the researcher in collaboration with OGADEP extension agents. The total sample size for both the participants and non-participants was 336.

2.4. Data analysis
Data obtained were subjected to descriptive and regression analysis; using the Statistical Package for Social Sciences (SPSS 20.0) and STATA 14 version. Results were presented in frequencies, percentages, mean (x), Standard Deviation (SD) and regression (p-value). Regression analysis was carried out on the factors which influence the farmers to adopt GIZ-sponsored technologies. The hypothesis was tested with the aid of Chi-square and the decisions were made based on the outcome of the p-values.

Logit regression model was used in estimating the determinants of adoption of GIZ-sponsored technologies in the study area. The model is specified as follow:
Implicitly:
\[ Y = \beta_0 + \beta X \]  

Explicitly:
\[ Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_{22} X_{21} + U \]  

Where:

\( Y \) = GIZ-sponsored technologies (adopted = 1, not adopted = 0)

\( X_1 \) = Age of farmers (years).

\( X_2 \) = Marital status (married = 5, separated = 4, widowed = 3, divorced = 2 and single = 1).

\( X_3 \) = Sex.

\( X_4 \) = Religion (Christianity = 1, Islam = 2, Traditional = 3)

\( X_5 \) = Education level (primary, secondary, tertiary)

\( X_6 \) = Household size (number of persons per household)

\( X_7 \) = Farm size (hectares)

\( X_8 \) = Cost of the technology (naira)

\( X_9 \) = Ready market at a good price (kilometer)

\( X_{10} \) = Triability of technology (lumpy = 1, divisible = 2)
\( X_{11} = \text{Access to information (trainings received)} \)
\( X_{12} = \text{Farmer's perception (positive or negative)} \)
\( X_{13} = \text{Linkage with research institutes (numbers)} \)
\( X_{14} = \text{Topography (land shape)} \)
\( X_{15} = \text{Access to credit facility (accessible = 1, not accessible = 0)} \)
\( X_{16} = \text{Linkage with agro dealer (contacts)} \)
\( X_{17} = \text{Labour (surplus = 1, scarce = 0)} \)
\( X_{18} = \text{Membership in social group (belong = 1, not belong = 0)} \)
\( X_{19} = \text{Human preference factor (willingness = 1, not willing = 0)} \)
\( X_{20} = \text{Travel cost (naira)} \)
\( X_{21} = \text{Government policy (favorable = 1, unfavorable = 0)} \)

\( U = \text{Error term} \)
\( \beta_0 = \text{Constant term} \)
\( \beta_{1...21} = \text{Regression coefficient} \)

2.5. Chi square test

\[ \chi^2 = \sum \frac{O - E}{E}^2 \]  \hspace{1cm} (3)

\( \chi^2 = \text{Calculated Chi-square} \)
\( \Sigma = \text{Summation sign} \)
\( O = \text{Observed frequency} \)
\( E = \text{Expected frequency} \)

2.6. Result

The mean age, household size and farm size of the respondents were 44 years, 5 persons and 1.6 hectares respectively as presented in Table 1. Almost half (48.2%) of the respondents had tertiary education, most (64.9%) of the respondents were male. Moreover, majority (95.8%) were married, and all (100%) of the respondents belonged to a farmer association. Furthermore, results show that 60.1% of the respondents had been involved in GIZ's advisory for 3 years and 38.1% for 4 year.

Result in Table 2 show the factors that determine respondents' adoption of GIZ-sponsored advisory service. Technology cost (\( \beta = 0.4566, p <0.01 \)), good relationships between the GIZ's agents and the farmers (\( \beta = 1.0177, p <0.01 \)), and government policy (\( \beta = 0.4934, p <0.01 \)) significantly and positively determined the adoption of GIZ's sponsored advisory service. While triability of the technology (\( \beta = -0.4934, p <0.01 \)), and access to timely and relevant information
significant but negatively determined the adoption of GIZ’s sponsored advisory service among the participants in the study area. Table 3 and 4 shows the result of test of association between the farmers’ socioeconomic characteristics and the determinants of adoption. Significant relationship exists between determinants of adoption and sex ($\chi^2=126.094$) as well as education level ($\chi^2=90.386$).

3. Discussion
The cost of technologies sponsored by GIZ significantly and positively influenced the cassava growers to adopting it. The adoption on the part of the farmers resonates with associated cost of the technologies. This result is in consonance with that of Foster and Rosenzweig (2010) who stated that a key determinant of the adoption of a new technology is the net gain to the farmer from adoption, inclusive of all costs of using the new technology. They further posited that the cost of adopting agricultural technology has been found to be a constraint to technology adoption. This means that when the associated cost of adopting a particular technology is too high, such
technology could be rejected by potential adopters. This corroborates position of Kee (2017) who stated that initial capital requirement or cost is a key factor determining adoption pattern of a particular technology. For example, when the cost of technology increases or is high, there is a decrease in the use of such technology especially in the presence of competitive alternative. But when the cost incurred in adopting a technology is reduced or low, there will be consequent increase in the use or adoption of such technology. Therefore, policies that could bring about low cost agricultural innovations would cause increase in the adoption of innovations. And increased adoption of innovations could lead to better output and consequently increased income. The obvious determinants of new technology adoption are the benefits received by the user and the costs of adoption.

Also, mutual respect and interactions between GIZ extension agents and the farmers positively and significantly influenced adoption of the technologies by the farmers. This result is in tandem with those of Mignouna et al. (2011), Akudugu et al. (2012) who all reported a positive extension-
farmers relationship as a factor for technology adoption. When a development agency maintains a respectful dialogue with its intended beneficiaries, recognising their priorities from their points of view, and beneficiaries shape operational decisions, then, this creates a framework within which the agency impact are likely to be of high quality. It implies that when the interactions and exchanges between the farmers and the extension agents (GIZ) are cordial the more the extension agents are able to influence and convince the farmers to adopt the advisory service (technologies) being disseminated.

Government policy as it relates to agriculture in general and cassava production in particular was positive and significant. The implication is that the more the government of the dayformulates and enacts policies that are relevant to cassava production the more the adoption of advisory service. Some of the government policies encouraging cassava production are zero tariffs for import of agricultural equipment and agro-processing, increase tariff on cassava products, 10% cassava flour substitution for bread and blending 10% ethanol with petrol. In the past, increasing agriculture was the principal goal of agricultural policies worldwide. Today, protecting environmental quality and the resource base of agriculture is becoming the primary concern in much of the world. For example, if it is not profitable for farmers to adopt environmental sustainable technology all alone by themselves, government could encourage them with financial incentives by putting workable policies in place. It would go a long way to enhance environmentally sustainable management practices that contribute positive externalities in agriculture (e.g., enhance biodiversity). This result buttressed that of OECD (2003) which reported that the type and uptake of environmentally sustainable technologies is influenced by a range of policies that provide incentives or otherwise.

One of the ways of introducing a new technology to farmers involves demonstrations plots, and the new technology will be adopted when found beneficial. Triability as it relates to GIZ-sponsored technologies was positive and significant among the cassava growers. This is in line with the finding of Tan and Teo (2000) whose argument was that if farmers are allowed to experiment with innovation, it will reduce certain unknown fears, and lead to adoption. This also corroborates the findings of Agarwal and Prasad (1998) and Rogers (2003) who stated that if the innovation is allowed to be experimented by the potential users, they will feel more comfortable with that technology and their adoption rate will also increase. It implies the more the farmers were able to see the technologies being disseminated by GIZ's extension agents demonstrated out on a small plot of land the more they adopted them. When farmers' adoption of an innovation reduced upon experimentation, it could be that the outcome of the demonstration plot does not meet their expectation. Hence, they decline adopting such, counting them as irrelevant. According to Carayannis and Turner (2006), triability seems to be an opportunity in which a service or innovation could be applied by potential consumers or experimented with on a trial basis.
However, farmers’ access to timely and relevant information on GIZ-sponsored technologies was negative but significant. It means the more information the farmers get access to on the technologies given by the GIZ’s advisory agents the less they adopt them. This could be attributed to the discovery of some unpleasant features of the components of the technologies sponsored by GIZ. This result is at variance with that of Khalid et al. (2017) who reported that information about a new technology is a serious factor that determines adoption. They posited that information obtained directly from project manager has a positive influence on technology adoption. This is an indication of the importance of obtaining accurate and sufficient information on the nature of the technology and what benefits can be achieved when using it. This serves as an incentive to encouraging farmers in technologies’ adoption. Most farmers, due to the fear of the possible risks associated with the new technology tend to defer or do not immediately adopt it despite having full information about its potential benefits. Nevertheless, in subsequent time periods potential adopters acquire more information about the benefits of the technology and the degree of riskiness associated with it. Information reduces the uncertainty about a technology’s performance hence may change individual’s assessment from purely subjective to objective over time (Sugandini et al., 2018). At the early stages of introduction of a new technology, only few farmers obtain full information about the potential economic benefits of the technology and hence the adoption speed is slow.

The test of association between the farmers’ socioeconomic characteristics and the determinants of adoption reveals significant relationship between determinants and sex as well as between determinants and education level. It implies that age and education level of the farmers determine their adoption of technology. This result buttress Rogers (1983) who stated that younger and more educated farmer are venturesome, and willing to take risk, while the older and less educated farmers are conservative, and not willing to take risks. Able-bodied and educated young men and women should therefore be encouraged to go into cassava farming as this will bring about increased productivity for the farmers and trickling down effects will positively affect their immediate environment and the nation at large.

The respondents mean age (44 years) is an indication that they are within the economically active age. It could positively influence the adoption of innovation. This result corroborate the finding of Adesope et al. (2012) who reported that farmers in the middle age are in their economically active age and as such could undergo stress which could positively influence productivity. Also, the respondents’ average farm size was 1.6 hectares. It implies that the cassava growers are small-scale farmers. According to Yaron et al. (1992) and Harper et al. (1990), small farm size may provide an incentive to adopt a technology especially in the case of an input-intensive innovation, such as a labor-intensive or land-saving technology.

4. Conclusion and recommendation
A number of factors were found positive and they significantly influenced the cassava farmers’ decision in the adoption of GIZ-sponsored technologies. The more attractive the overall cost associated with the technologies the more will be the adoption rate by the farmers. Also, with better relationship and mutual respect between the farmers and GIZ agents, there will be an increase in the rate with which the farmers adopt the disseminated technologies. Furthermore, the ability of a particular technology to be demonstrated out on small scale by the GIZ-farmer collaboration enhances the chance of its adoption on the part of the farmers. Favorable policies by GIZ and government will also boost adoption of the disseminated technologies by the farmers. Nevertheless, accurate and sufficient information on the nature of the technologies and what benefits can be achieved when using it should be made available to farmers. This will eliminate any fear of the possible risks associated with the new technologies which might have come with the initial incomplete information. Thus, potential adopters might likely adopt the new technologies as a result of reduction in the level of uncertainty as they acquire more and more information about the benefits of the technologies and the degree of riskiness associated with it. The study therefore recommends complete information on the nature, associated risks and the benefits
derivable from the sponsored technologies. It finally recommends government-friendly and GIZ-friendly policies by both the GIZ and government for the benefit of the cassava farmers’ increased productivity in the State.

Funding
The authors received no direct funding for this research.

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Citation information
Cite this article as: Determinants of adoption of Deutsche Gesellschaft Für Internationale Zusammenarbeit (GIZ)-sponsored technologies among cassava farmers in Ogun State, Nigeria. R.O. Sanusi, E.O. Fakoya, R.A. Oyeyinka, A.M. Omotayo, B.O. Ajibola & A.S. Ajibade, Cogent Food & Agriculture (2021), 7: 1917165.

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