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Does Growth Enhancement Support Scheme (GESS) Contribute to Youth Development in Informal Farm Entrepreneurship? Evidence from Rural Communities in Nigeria [1]

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Does Growth Enhancement Support Scheme (GESS) Contribute to Youth Development in Informal Farm Entrepreneurship? Evidence from Rural Communities in Nigeria

Joseph I. Uduji, Elda N. Okolo-Obasi & Simplice A. Asongu

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Abstract

Purpose – The purpose of this paper is to critically examine the impact of a growth enhancement support scheme (GESS) on youth development in informal farm entrepreneurship in Nigeria. Its special focus is to investigate the impact of the GESS on rural youths' adoption of new technologies needed to sustainably increase food security in Nigeria.

Design/ methodology/ approach – This paper adopts a survey research technique, aimed at gathering information from a representative sample of the population, as it is essentially cross-sectional, describing and interpreting the current situation. A total of 800 rural youths were sampled across the six geopolitical zones of Nigeria.

Findings – The result from the use of a bivariate probit model indicate that the GESS has a significant impact on rural youths' innovations in farming.

Practical implication – This suggests that information and communication technology (ICT) could provide new opportunities for making farming more interesting and enterprising for rural young people.

Social implication – It implies that while old male and female farmers are less likely to adopt the new farming technologies needed to achieve Nigeria's agricultural transformation agenda (ATA), a younger generation can help introduce new technologies, whilst also learning from traditional methods.

Originality/ value – This research adds to the literature on informal farm entrepreneurship and rural communities' debate in developing countries. It concludes that engaging youths in GESS should form the foundation of the ATA in Nigeria, which, in turn, would offer adequate combination of new and traditional solutions to address the challenges of food insecurity in sub-Saharan Africa.

Keywords: Youth Development Initiative, Informal Farm Entrepreneurship, Growth Enhancement Support Scheme (GESS), Rural Communities in Nigeria.

Paper type Research paper

1. Introduction

Engaging youths in farming has provided a topic for discussion that has occupied an important space on the development agenda, as there is a growing concern worldwide that the youths are becoming disenchanted with farming (AGRA, 2015). Accordingly, agricultural development specialists and policy makers around the world are concerned that young people are no longer interested in remaining in rural areas and taking up farming as a career (Paisley, 2014). Farming holds no prestige and rural youths taking it up as a livelihood are generally poor and not considered success stories in Africa. However, while farmers and farming will always remain a source of livelihood for many in rural communities, the concern is that young people do not see any prospect for themselves in adopting farming as an active profession in the long-run. As a result, many of the rural farmers who still remain are old men and women (Uduji & Okolo-Obasi, 2017, 2018a, 2018b, 2018d, 2019). Increased productivity in farming mandates that African farmers move from the traditional mode of farming production to one based on science and technologies (Gregory and Bumb, 2006, Uduji *et al,* 2018a, 2018b, 2019a, 2019b). New technologies on farming are embodied in the use of modern inputs such as improved seeds, fertilizers, crop protection products (CPPs), and other advanced agronomic practices.

In 2012, the federal government of Nigeria (FGN) introduced the Growth Enhancement Support Scheme (GESS), as part of its Agricultural Transformation Agenda (ATA) to transform the delivery of subsidized inputs to farmers in the country (Adesina, 2013; Uduji *et al,* 2019c, 2019d, 2019e). Unlike the previous paper vouchers scheme (PVS), GESS delivers inputs subsidies to farmers through electronic wallet (e-wallet). Through the e-wallet system, farmers would receive their allocations of agricultural inputs via mobile phone text-messages in order to reduce the level of corruption and graft in the agricultural system (Akinboro, 2014). The farmer is getting a subsidy of 50% and would pay the balance, then collect the inputs from the nearest agro-dealer in the community (IFDC, 2013). Compared to the previous voucher and subsidy schemes in the country, the GESS is apparently more efficient, transparent and reaches more farmers (Grossman & Tarazi, 2014; Uduji *et al,* 2018a, 2019f, 2019g). However, scholars and civil society actors such as Trini *et al* (2014), Nwalieji *et al* (2015), Fadairo*et al* (2015) and others have argued that the federal government's GESS programme in Nigeria is neither far-reaching nor deeply entrenched in rural areas. This difference in perceptions invariably sets the context for the GESS debate, pitting those in favour of preserving the GESS programme against those who insist that the GESS must adapt to changing societal values in rural communities. Of late, proponents such as Adenegan *et al.* (2018) have suggested that the GESS exerts a positive impact on income of cassava growers and maize farmers, indicating that productivity-enhancing

agricultural innovations can contribute to raising the income of farming households. This suggests a pathway to improve poverty alleviation and food security in Nigeria and other developing countries of the world. Recently, Uduji and Okolo-Obasi (2018b) added some gendered-nuances to the debate, arguing that participation of young rural women in the GESS programme enhances the usage intensity of modern agricultural inputs in Nigeria.

Meanwhile, rural youths in Nigeria often associate agriculture with menial work and disenchanted with the meager opportunities for a rural livelihood (Uduji & Okolo-Obasi, 2018b, 2018c). This has created some incentives for youths to migrate to cities, thus fuelling the frustrations and tensions in already saturated urban centers. Young people risk their lives in attempts to reach Europe as migrants crossing the Mediterranean (Uduji *et al*, 2018b, 2018d). In context, some authors have suggested that a mechanism by which the lives of youth can be improved is through the amelioration of communities in which they live in order to make them better places (Villaruel *et al*, 2003; Lerner *et al*, 2002). Other authors highlight the importance of strengthening communities, so that they can be functional in nurturing and supporting young people, thus ensuring sustainable development (Shaff & Kipp, 2009; Benson & Pittman, 2001). Against this background, our emphasis in this study is on empowering and developing rural youths; so that they will in-turn contribute positively to human food and nutritional needs of their communities. The GESS programme is a development agenda that provides young people with the resources needed to improve their livelihoods and those of their communities by means of an agricultural transformation programme. Thus, the objectives of this investigation, which were in line with the GESS relative to ATA in sustainable development goals (SDGs) were to:

- Analyze the factors that influence decisions of rural youths' participation in the GESS programme in Nigeria.
- Examine the impact of the GESS programme on rural youths' adoption of new farming technologies (improved seed, fertilizers, crop protection products, and other agronomic practices) needed for sustainable entrepreneurship to increase food security in Nigeria.
- Determine the consequences of youth development in informal farm entrepreneurships in Nigeria.

The resulting research question which is emphasized in the title of the study is as follows: is the GESS impact on rural youths' adoption of new technologies needed to sustainably increase food security in Nigeria?

The corresponding testable hypothesis builds on the following points. Rural youths are the future of food security, but few see a future for themselves in agriculture or rural areas. As a result, many young people migrate to cities, leaving the farm for old men and women, and thus worsening an already marked low productivity in the farms. Thus, we hypothesize that the federal government's GESS programme has not significantly impacted on rural youths' adoption of new farming technologies needed to sustainably increase food security in Nigeria.

The positioning of the study in response to the testable hypothesis contributes to the growing literature on the relevance of information technology in development outcomes (Chavula, 2013; Carmody, 2013; Afutu-Kotey *et al*. 2017; Tchamyou & Asongu, 2017; Bongomin *et al*. 2018; Asongu *et al,* 2020a, 2020b, 2020c, 2020e; Gosavi, 2018; Isszhaku *et al*. 2018; Asongu & Asongu, 2018; Hubani & Wiese, 2018; Uduji *et al,* 2020a, 2020b, 2020c, 2020d, 2020e; Minkoua Nzie *et al*. 2018; Asongu *et al,* 2019a, 2019b, 2019c, 2019d; Abor *et al*. 2018; Tchamyou, 2019, 2020; Tchamyou et al., 2019a, 2019b; Muthinja & Chipeta, 2018; Uduji & Okolo-Obasi, 2020; Uduji *et al,* 2018a, 2018b, 2019b; Ugwuanyi *et al,* 2020; Rashiti *et al,* 2017; Dana, 2011; Ramsdani *et al,* 2019; Nikopoulos & Dana, 2017; Mason *et al,* 2009; Dana, 2007). This literature is expanded in Section 2 with emphasis on the contemporary importance of information technology in agricultural productivity.

The rest of this paper is organized as follows. The literature and theoretical underpinnings are discussed in Section 2. Section 3 describes the materials and methods. Section 4 presents the results and corresponding discussion. Section 5 concludes with implications and future research directions.

2. Literature and theoretical underpinnings

2.1 Youth and farms

Global population is expected to increase to 9 billion by 2050, with youth (aged 15-24) accounting for about 14 percent of this total (FAO/CTA/IFAD, 2014). While the world's youth cohort is expected to grow, employment and entrepreneurial opportunities for youth – particularly those living in developing countries' economically stagnant rural areas-remain limited, poorly remunerated and of poor quality (AGRA, 2015; Bloom, 2012). Rural youths face many hurdles in trying to earn a livelihood (Dana, 2007). For example, pressure on

arable land is high in many parts of the world, making it difficult to start a farm (Uduji & Okolo-Obasi, 2018a, 2018b, 2019b, 2019c). Youth often also lack access to credit, and many other productive resources necessary for farming (Dana, 2011). To make a living, the youths in sub-Saharan Africa face four options: to obtain high level of education which is not accessible to many of them; to go back to unattractive rural farming; to become self employed by learning a trade; or to opt for migration (Uduji *et al*, 2019a, 2019b, 2019c). Hence, this study seeks to examine the impact of GESS on new development in informal farm entrepreneurship in Nigeria.

2.2 Informal entrepreneurship

According Ramadani *et al* (2019), most of the existing entrepreneurship literature focuses on formal enterprise but more recently more attention has been placed on informal entrepreneurship. Entrepreneurship usually implies law abiding activity, but informal entrepreneurship can involve unauthorized or illegal entrepreneurship activity that can include tax evasion and self-employment (Rashiti *et al,* 2017; Nikolopoulos & Dana, 2017; Dana, 2011; Ramadani *et al,* 2019; Dana, 2007). The informal economy provides individuals with business opportunities regardless of immigration status or educational qualifications and this is especially important to entrepreneurs (Ramadani *et al,* 2019; Mason *et al,* 2019; Dana, 2007). In the context of this paper, informal sector farmers are defined as those that are not legally registered at the national level of federal government of Nigeria GESS programme, although could be connected to a registered association (Uduji *et al,* 2019a, 2019c, 2019f, 2019g).

2.3 Mobile telephony in agriculture

The extant literature on the nexus between information technology and macroeconomic outcomes can be discussed in three main strands, notably: (i) the connection between information technology and access to finance; (ii) determinants and drivers of financial inclusion and innovation; (iii) nexuses between information technology, financial inclusion and economic development which includes the linkage between mobile technology and agricultural productivity. The three strands are discussed in chronological order.

In the first strand on the linkage between information technology and financial access, Gosavi (2018) has assessed how mobile technology adoption reduces concerns related to financial access in a sample of countries in Eastern sub-Saharan Africa. The author has concluded that

corporations using mobile money are more associated with higher levels of financial access owing to enhanced possibilities of obtaining lines of credit and/or loans. Bongomin *et al*. (2018) investigate how social networks moderate the relationship between mobile telephony and inclusive finance in rural Uganda. From the results, a direct impact is apparent between financial inclusion and the usage of mobile money. Moreover, social networks are also established to exert a significantly moderate impact.

In the second strand on determinants and drivers of inclusion and innovation, Muthinja and Chipeta (2018) have conducted an empirical analysis on the macro- and firm-level determinants of branchless banking in the commercial financial sector of Kenya. The authors have established that at the firm's level, the following drive branchless banking: firm constraints, agency cost, transaction cost, firm size and technological advancements. However, critical determinants at the macro level are incompleteness in financial markets and globalisation. Humbani and Wiese (2018) have assessed motivations behind the readiness of consumers to use certain services of mobile payment. The results show that convenience and compatibility are the main determinants in the decision to adopt the technology whereas, insecurity, risk and cost are discouraging factors. In addition, it is also found that gender moderates the relationship between convenience and the use of mobile services.

The third strand is concerned with the associations between mobile phone penetration, inclusive finance and economic development, *inter alia*: economic growth (Abor *et al*. 2018); health outcomes (Kliner *et al*. 2013); female empowerment (Ojo *et al*. 2012); reduction of the gap between rural and urban development (Li *et al*. 2011; Asongu & Nwachukwu, 2018) and improvement of agricultural productivity through among others, the reduction of supply-demand mismatches as well as demand-side and supply-side constraints (Muto & Yamano, 2009; Aker & Fafchamps, 2010; Asongu, 2019). In what follows, we expand on this dimension of agricultural productivity in order to situate the positioning of this study within the context of extant literature.

In the last strand Issahaku *et al*. (2018) examine the concern of whether smallholder maize farmer's productivity is affected by mobile phone usage in Ghana. The results reveal that the agricultural productivity is significantly improved by the adoption and usage of mobile phone technologies. In another study, Minkoua Nzie *et al*. (2018) have assessed the impacts of mobile phone usage on costs of transaction associated with the search for information and

transaction cost. They establish that unlike for cabbages, the use of mobile phones by farmers increase transaction cost for tomatoes and carrots. Wyche and Steinfield (2016) have investigated whether smallholder farmers with information on agricultural productivity are associated with enhanced crop production. They conclude that while such services promote agricultural productivity in developing countries, it is not the case in Kenya. Bello-Bravo *et al*. (2018) examine learning gains from traditional extension presentations versus educational animated videos among farmers in Benin to establish that while both approaches are linked with learning gains, the latter approach resulted in significantly more knowledge retention and higher test scores. Alam and Wagne (2016) have examined the relative relevance of monetary versus non-monetary drivers for the adoption of ICT in rural agribusiness to conclude the non-monetary motivations (i.e. uncertainty mitigation and procedural fairness) can be more relevant than monetary rewards. Jain *et al*. (2015) examine the role of mobile telephony in the dissemination of agricultural knowledge to conclude that there is need to develop agricultural information systems in order to increase the potential benefits to farmers in Punjab. Mugwisi *et al*. (2015) investigate access to and utilization of ICT by extension workers and agricultural researchers in Zimbabwe to conclude that the role of ICT (especially in work and information diffusion) is not sufficient irrespective of access to ICT by researchers and extension workers.

The scant literature on the relevance of mobile telephony in agricultural productivity and subsequent food security, with specific emphasis on Nigeria and the associated GESS has been discussed in the introduction. Hence, we do not rearticulate the positioning of this paper within the context of the GESS-centric literature.

2.4Theoretical underpinnings

The decision by youths to adopt mobile phones for agricultural production can be theoretically framed by three dominant theoretical views which elucidate the motivation of farmers to adopt and use mobile technologies for agricultural outcomes (Yousafzai *et al*. 2010; Nikiforova, 2013; Cusick, 2014; Lee & Lowry, 2015; Uduji & Okolo-Obasi, 2018d; Asongu *et al.*, 2018; Uduji *et al.*, 2018b, 2019c). In other words, building on the problem statement in this study, the rural youths' adoption of new technologies in accordance with the GESS is contingent on three main theoretical underpinnings, namely: the theory of reasoned action (TRA), theory of planned behavior (TPB) and technology acceptance model (TAM).

With regards to TRA, customers demonstrate rationality as far as the acknowledgement of the actions they take is concerned (Fishbein & Ajzen, 1975; Ajzen & Fishbein, 1980; Bagozzi, 1982). The TRA is improved to the TPB: an extended theory which lays emphasis on the lack of disparities among users who have some conscious influence pertaining to the actions they take and users who are deficient of such influence (Ajzen, 1991). As concerns that TAM, the motivation behind a user's decision to adopt a given mode of communication technology can be explained by one fundamental factor, namely: the voluntary will of the user to accept and use the given technology (Davis, 1989). In accordance with the underlying literature (Asongu *et al*, 2019a, 2019b; Uduji *et al*, 2018c; Asongu & Odhiambo, 2019a, 2019b), what is common among the three theories is the influence of information technology on a number of features which affect the decision to adopt and use the underlying technology. These characteristics are the formation of customers' belief and composite elements such as psychological, personal, behavioral and utilitarian features (Dana, 2007; Rashiti *et al*, 2017; Ramadani *et al*, 2019; Nikopoulos & Dana, 2017; Mason *et al*, 2009; Dana, 2011).

The highlighted traits are features of the rural youth in Nigeria who could be in the process of adopting mobile technologies that are associated with the GESS programme. The nexus between the characteristics and the decision to adopt mobile technologies is contextualized in four main strands. (i) From the utilitarian perspective, the adoption of mobile technology by youth farmers can be motivated by the fact that it enables them to actively participate in the federal government's GESS programme. (ii) From a behavioral angle, some youths could adopt mobile technologies because they are constrained by the need to remain in accordance with improvements in the system of agricultural. (iii) Psychological and personal motivations also influence the adoption decision by the youth farmers. This is apparent when such motivations are based on entirely idiosyncratic actions that are not associated with common tendencies in the agricultural market, notably: rural youth farmers' individual goals of increasing their agricultural productivities and annual revenues. (iv) The importance of the formation of customers' belief is founded on the fact that, in society, it is generally accepted that mobile technologies are relevant for the fruitful implementation of the GESS programme. The fourth point is specifically relevant when the adoption of mobile technologies in view of leveraging on the GESS programme is viewed as a social norm.

The above theoretical underpinnings and the contextualization of the theoretical underpinnings in the light of the GESS programme, theoretically elucidate the connection between rural youth farmers' adoption of mobile technologies and their potential benefits in sustainable food security from the GESS programme.

3. Materials and methods

The study adopts a quantitative methodology, as a contribution given the paucity of quantitative works on mobile technologies and inclusive agricultural development in Africa (Aker,2011; Olomola, 2015; Uduji *et al*, 2018a, 2018b). A survey research technique was used with the aim of gathering information from a representative sample of the population. It is essentially a cross-sectional sample that describes and interprets what exists at present. Figure 1shows the constituent states of the six geo-political zones in Nigeria.

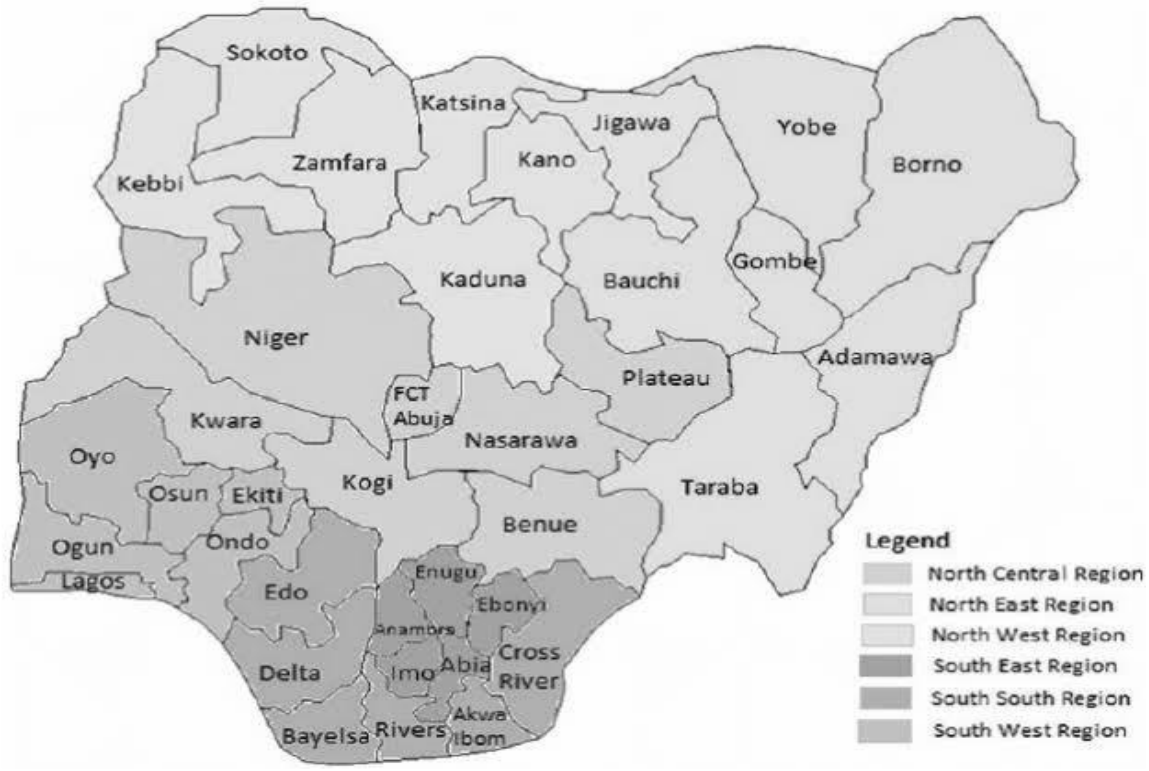

Figure 1. Constituent states of the geo-political zones in Nigeria.

Source: FGN, 2017.

3.1 Sample size

The sample size of this study is determined using a formula from Yamane (1964) for finite population as is shown in Eq. (1).

$$n = \frac{N}{1 + N(e)^2} \quad (1)$$

where n is the sample size, N denotes the total or finite population of the study area, e represents the level of significance (limit of tolerable error) and 1 is unity (constant).

The estimated total population of rural youth farmers in the study area is shown in Table 1.Hence N = 6,699,630and the level of significance of the study is 5 percent, which is a 95 percent confidence level, indicating e = 0.05 percent

Thus:

$$n = \frac{6{,}699{,}630}{1 + 6{,}699{,}630(0.05)^2} = 400$$

The resulting quotient was multiplied by 2 to ensure that an adequate sample was selected for the study. Hence the total sample size determined is 800 as shown in Table 1.

3.2 Sampling procedure

To ensure good responses in the study, multi-stage probability involving both cluster and simple random samplings were used to select respondents. In the first stage, to ensure that the population is adequately represented, the states were clustered according to the six geo-political zones of Nigeria: North-East, North-Central, North-West, South-East, South-South and South-West. In stage Two, a purposive sampling was used to select one State from each of the six clusters (geo-political zones) based on the intensity of agricultural practices in the States as follows: Benue State (North-Central), Adamawa State (North-East), Kano State (North-West), Ebonyi State (South-East), Cross Rivers State (South-South), and Ekiti State (South-West). In stage Three, all the local government areas (LGAs) in each of the selected States were listed and using purposive sampling, two LGAs were selected from each State based on the intensity of agricultural practices in the LGA. On this note, a total of twelve (12) LGAs were selected for the study. In the fourth stage, to ensure proper representation, the main communities in the selected LGAs were listed and three communities were randomly selected from each LGA giving a total of thirty-six (36) rural farming communities for the study. In the last stage, out of the thirty-six communities selected, with the help of the traditional and community leaders, 530 registered farmers and 270 non-registered farmers were selected, giving a total of 800 respondents randomly selected as explained in Table 1.

Table 1. Sample distribution

Zones	Male	Female	Total Population	Youth Population	Youth Farmers	Sample per state	Sample per community	
							Regd	Non-Regd
Adamawa	2,148,009	2,100,427	4,248,436	1,911,796	860,308	105	23	12
Benue	2,873,778	2,868,037	5,741,815	2,583,817	1,162,718	139	31	15
Cross River	1,967,158	1,899,111	3,866,269	1,739,821	782,919	95	21	11
Ebonyi	1,407,931	1,472,452	2,880,383	1,296,172	583,278	72	16	8
Ekiti	1,657,313	1,613,485	3,270,798	1,471,859	662,337	79	17	10
Kano	6,882,368	6,194,524	13,076,892	5,884,601	2,648,071	310	69	34
	16,936,558	**16,148,035**	**33,084,593**	**14,888,067**	**6,699,630**	**800**	**177**	**90**

Source: National Bureau of Statistics (NBS), 2018/Authors' computation

3.3 Data collection

Data for this study were collected mainly from primary sources. A Participatory Rural Appraisal (PRA) technique, namely semi-structured interview (SSI) questionnaire was used in the primary data collection. The use of participatory research technique in collecting the GESS impact data within the framework of rural youth farmers is based on two fundamental factors, notably: it involves the people being studied, and the views of the sampled population on all the issues being investigated are relevant to the study. The SSI used was divided into three sections. Section 1of the instrument elicited information on the socio-economic characteristics of respondents, while the other two sections elicited information based on the two research questions. This semi-structured interview questionnaire was the major tool the study used for the household survey. It was directly administered by the researchers with the help of a few local research assistants. The local research assistants were necessary in order to bridge the language barrier due to the involvement of many ethnic groups of Hausas, Yorubas, Igbos, Fulanis, Kanuris, Idomas, Tivs, Ijaws, Ogonis, Ikweres, Etches, Ekpeyes, Ogbas, Engennes, Obolos, Isokos, Nembes, Okirikas, Kalabaris, Urhobos, Iteskiris, Ika-Igbos, Ndonis, Orons, Ibenos, Ibibios, Anangs, Efiks, Bekwarras, Binis, Eshans, Etsakos, Owans, Itigidis, Epies, Akokoedos, Yakkurs, *inter alia*, in the sampled rural communities.

The use of local research assistants was motivated by the inability of researchers to speak most of the different languages and dialects of the sampled rural communities.

3.4 Analysis technique

Data collected from respondents in the field were subjected to a series of treatments. Both descriptive and inferential statistics were used to analyse the data, so as to achieve the

objectives of the study. In modeling the impact of the GESS on rural youth farmers' adoption and use of agricultural input, we used the bivariate probit model to test the hypothesis of the study which states that there is no significant correlation between the random terms of participating in the e-wallet model and the adoption of modern agricultural inputs. The modelling exercise is therefore tailored towards answering the following questions:

- What are the factors that influence decisions of rural youths' participation in the GESS programme in Nigeria?
- Does the GESS impact of the GESS programme on rural youths' adoption of new farming technologies (improved seed, fertilizers, crop protection products, and other agronomic practices) needed for sustainable entrepreneurship to increase food security in Nigeria?
- What are the consequences of youth development in informal farm entrepreneurships in Nigeria?

In modeling the impact of the GESS and adoption of modern agricultural inputs, so many statistical models such as logit, probit and tobit models could be applied. As good as this specification may be, we noted two major interdependent decisions, notably: the decision to participate in the government's GESS programme and the decision to adopt modern agricultural inputs. According to Kefyalew *et al* (2016) and Tura *et al,* (2010) using such model specifications might result in ineffective parameter estimation as it may fail to capture the correlations between the two major decisions. Hence in accordance with Greene (2012), modelling such interdependent decisions requires a model like the bivariate probit model. The bivariate probit model which is a natural extension of the probit model appears in both the decisions to register and participate in the government's GESS programme and that of using the model to access modern agricultural inputs. In the light of these underpinnings, the study built on the models developed by Kefyalew *et al.* (2016) and Tura *et al*(2010) to analyse the two decisions. The work used econometric Views (EViews) and STATA software to analyse and compare the data generated. However, the results of EViews were adopted because it is particularly easy to employ the probit model in EViews since there is an in-built cumulative bivariate Normal function that is used for the corresponding tests.

3.5Model specification

In specifying the model, we noted that the latent Y* from the decision to register and participate in the GESS depends on a vector of explanatory variables 'x' so that the binary

outcome Y= 1 arises when the latent variable Y*> 0. Another observation to the interdependency of the decision is the Y2 which is, using the GESS model to access and adopt the modern agricultural inputs is only observed if Y1 (participation in the GESS programme) =1. The outcome of the decision represented by the first probit equation is fully observed. However, there is a censored sample in the second equation using the model to access modern agricultural inputs. According to Tura *et al* (2010) this censoring of observations reflects the importance of taking into account self-selection at the registration and participation decision making stages to ensure proper estimation of model parameters.

Hence having the knowledge that there are two latent variables:Y1*and Y2* and that Green (2012) assumed each observed variable takes on the value 1 if and only if its underlying continuous latent variable takes on a positive value. The bivariate model is stated thus:

$$Y1=\begin{cases}1, \text{if } Y1 *> 0\\ 0, \text{otherwise}\end{cases} \quad \text{Eq. (2)}$$

$$Y2=\begin{cases}1, \text{if } Y2 *> 0\\ 0, \text{otherwise}\end{cases} \quad \text{Eq. (3)}$$

$$\text{with}\begin{cases}\gamma 1 *, X1\beta 1 + \varepsilon 1\\ \gamma 2 *, X2\beta 2 + \varepsilon 2\end{cases} \quad \text{Eq. (4)}$$

and

$$\binom{\varepsilon 1}{\varepsilon 2} \backslash X \sim \mu\binom{0}{0}, \binom{1P}{P1} \quad \text{Eq. (5)}$$

Note

Y1*and **Y2*** are underlying latent variables

Y1 = 1, if sampled rural youth farmers register and participate in the government GESS programme, 0 otherwise (i.e. never registered and participated in the government GESS Programme at the time of survey).

Y2= 1, if sampled rural youth farmers use the GESS to access modern agricultural inputs, 0 otherwise

$\boldsymbol{\beta 1}$and $\boldsymbol{\beta 2}$ are vectors of estimation parameters to be computed.

X1and **X2** are list of explanatory variables entered into the estimation model.

$\boldsymbol{\varepsilon 1}$and $\boldsymbol{\varepsilon 2}$ are normally distributed error terms.

From the above we maximize the likelihood of the bivariate model by estimating the values of $\beta 1$, and ρ to properly fit the model. To make this assessment, we have the likelihood as :

L(β1, β2) = (π**ρ**(Y1=1, Y2=1/ β1, β2)Y1Y2 **ρ**(Y1=0, Y2=1/ β1, β2)(1-Y1)Y2 **ρ**(Y1=1, Y2=0/ β1, β2)Y1(1-Y2) **ρ**(Y1=0, Y2=0/ β1, β2)(1-Y1)(1-Y2) Eq. (6)

Substituting the latent variables Y1*and Y2*in the probability functions and taking logs gives:

$\sum Y1Y2\ln\rho(\varepsilon1>-X1\beta1,\varepsilon2>-X2\beta2)+(1-Y1)Y2ln\rho(\varepsilon1<-X1\beta1,\varepsilon2)>-X2\beta2)+(1-Y1)(1-Y2)ln\rho(\varepsilon1<-X1\beta1,\varepsilon2<-X2\beta2)$ Eq. (7)

And the equation is simplified by re-writing so that the log-likelihood function appears thus:

$\sum Y1Y2\ln\Phi(X1\beta1,X2\beta2,\rho)+(1-Y1)Y2ln\Phi(-X1\beta1,-\rho)+(1-Y1)(1-Y2)ln\Phi(-X1\beta1,-X2\beta2,\rho)$ Eq. (8)

From the last equation, Φ is the cumulative distribution function of the bivariate normal distribution. Similarly, Y1and Y2 in the log-likelihood function above are observed variables being equal to one or zero depending on the rural youth farmer's decision regarding participation in the e-wallet model and using the model to access modern agricultural inputs. From the above, there are three possible different observations obtainable from each respondent rural youth farmer and is summarized below as follows:

$Y2 = 0$: $prob(\ Y2 = 0) = 1 - \Phi(X2\beta2)$ Eq. (9)

$Y1 = 0,\ Y2 = 1$: $prob(Y1 = 0,\ Y2 = 1) = \Phi_2(-X1\beta1x, X2\beta2, -\rho)$ Eq. (10)

$Y1 = 1,\ Y2 = 1$: $prob(Y1 = 1,\ Y2 = 1) = \Phi_2(-X1\beta1x, X2\beta2, \rho)$ Eq. (11)

Representing the variable to be fitted into the model from X_1-------X_n is seen below:

- X_1 = Age of a farmer (years)
- X_2 = Highest level of educational qualification (years)
- X_3 = Marital status of respondent framer
- X_4 = Household size of farmer (number)
- X_5 = Access to farm credit by farmers (1=accessed and 0 otherwise)
- X_6 = Size of farm cultivated by farmers (hectare)
- X_7 = Ownership of mobile phones (1= owned, 0 = otherwise)
- X_8 = Sources of seeds (1= e-wallet and 0= otherwise)
- X_9 = Farming experience (years)
- X_{10} = Off-farm income
- X_{11} = Value of farm output of farmers in naira (N)
- X_{12} = Mobile network coverage (1= covered and 0 = otherwise)
- X_{13} = Land ownership type (1= inheritance, 0 otherwise)
- X_{14} = Contact with extension agent (number of times)
- X_{15} = Distance to improved seed selling point (1 = far, 0 = otherwise)

X_{16} = Membership of cooperative organization
= Stochastic error term.

4. Results and discussion

4.1 Econometric estimation result

To estimate the factors affecting the rural youth farmers' decisions to register and participate in the government's GESS programme and adopt modern agricultural inputs; a bivariate probit model was applied. This model was tested against other models with the result showing that it was valid and fit for estimation. Also multicollinearity was measured using the variance inflation factor (VIF). This VIF assesses how much the variance of the estimated regression coefficient increases if the predictors are correlated. In the study, we noted that the VIF values of the independent variables are always below 3. Hence, the bivariate probit regression coefficients are properly estimated. The bivariate probit model used in the study was found to be valid. This is because, the likelihood ratio test carried on independent equations shows that random terms of registration and participating in the GESS programme and also adoption and usage of modern agricultural input are strongly correlated. The significance of the LR test ($\rho=0$) is an implication that the decision to register as a rural youth farmer and the decision to adopt modern agricultural inputs are affected by almost the same set of unobservable heterogeneities; meaning that the two decisions are to a large extent jointly made. This is why the study concludes that to estimate a univariate equation will result to inefficient parameterization and therefore choose a bivariate probit model.

4.2. Participation of rural youths in the GESS Programme

Table 2. Estimation of rate of participation in the GESS by rural youth farmer

States (Geo-political Zones)	Estimated Population of Youth Farmers	No. of Registered Youth Farmers	Percentages
Adamawa (North-East)	643,738	289,682	45
Benue (North-Central)	855,287	436,196	51
Cross River (South-South)	585,830	228,474	39
Ebonyi (South-East)	440,832	105,800	24
Ekiti (South-West)	485,789	155,452	32
Kano (North-West)	1,903,761	1,104,181	58
Total	**4,915,236**	**2,064,399**	**42**

Source: Computed from the field data by authors.

Participation in the GESS starts with registration of farmers and Table 2 shows that among youth farmers, only about 42 percent of them in the study area are registered. This implies that, there is absolutely more work to be done to make sure that the farmers actually take the first step. This is owing to the fact that the youths who are much aware should be the first to take the registration by storm. In Table 3, the econometric estimations show that at the 1percent significance level, ownership of the mobile phone, access to power source for charging phones, land ownership type and contact with extension (change) agents were significant. This shows that farmers with access to mobile phones(which is the major source of communicating the GESS information) have a higher probability to register and participate in the programme. Also access to power to charge the mobile phone is as much important as ownership. This two, combined with adequate land ownership and access to change (extension) agents will definitely promote participation. On the other hand, marital status surprisingly is negatively affecting farmers' registration and participation in the programme. This, we noted was as a result of the fact that young rural women rarely participate in the development intervention as they majorly face cultural related obstacles. This is because as the land is available, the extension agent plays a major role in the provision of information about the modalities of the GESS programme.

At the 5 percent significance level, the educational level, value of participants' output and mobile network coverage were positively significant, showing that an increase in any of these factors positively influences participation in the GESS programme. Increase in education, improves the capacity to read and write which is required in the e-wallet text messaging; while access to power source and mobile network coverage ensure that phones are active and massages sent are received and acted upon. Increase in the output of users is a natural motivation for non-users. Also at the same level (5 percent), the age of farmers and their farming experiences were negatively significant. This shows that as the age of the farmer increases with the experience in farming, the tendency to participate in the GESS programme decreases. At the 10 percent significance level, access to credit and off-farm income was positively significant, showing that increased access to credit and off-farm income provides funds with which to redeem the inputs.

Table 3. Econometric estimates of bivariate probit models for participating in the GESS by rural youth farmers in Nigeria.

Variables	Coefficients	Standard errors	|P| z > z|
Constant	-.2531	.3020	.9251
Age (years)	- 154	.128	0.342**
Education (years)	0.032	953	0.145**
Marital status	-0.266	1.139	1.217*
Household Size	- 0.231	1.21	1.218
Access to Credit	0.6251	0.042	0.175***
Size of farm	1.302	0.857	1.431
Mobile phone	2. 823	0.034	0.085*
Farming experience (years)	-3.136	0.027	2.213**
Off Farm Income	0.128	0.009	0.001***
Value of output (N)	2.91	0.034	1.078**
Mobile network coverage	3.125	0.021	0.0319**
Land Ownership Type	1.08	0.41	1.125*
Extension Contact	0.596	0.018	0.302*
Access to power supply	0.925	0.407	0.123*
Distance	-.021	0.07	0.824**
Number of observations	800	800	800
LR test (ρ=0)	χ 2 (1) =1224.31**		
Pseudo R^2	0.26		

Computed from the field data * = significant at 1% level; ** = significant at 5% level; *** = significant at 10% level

Source: Computed from the field data by authors.

A further probe into why some youth farmers have not registered for the GESS programmes reveals that, total lack of information has been the major reason (about 38 percent) while incomplete or misinformation accounted for 10 percent, hence informational issues account for about 48 percent of the reasons for not registering for the GESS programmes. Also distance to the registration point accounted for 17 percent while religious reasons, political affiliations and consistence in failure of government policies accounted for 13 percent, 16 percent and 6 percent respectively. This implies that, there is a serious need for extension of services to further market the programme.

4.3Rural youths adoption of new farming technologies

Table 4. Econometric estimates of bivariate probit models for adoption of new farming technologies by rural youth farmers in Nigeria

Variables	**Coefficients**	**Std. errors**	**|P| z > z|**
Constant	32.342	11.9117	7.9125
Age of a farmer (years)	- 0.1421	0.379	0.214**
Highest Level of educational qualification (years)	1.521	.175	0.123**
Marital status of respondent Farmer	0.2181	0.312	2.172*
Household size of farmer	- 1.0134	0.1321	1.83
Access to farm credit by farmers	0.218	0.523	0.175**
Size of farm cultivated by farmers (hectare)	4.725	2.712	1.81
Ownership of mobile Phone	1.687	1.769	0.032**
Farming experience (years)	-0.121	0.1443	4.93*
Membership of cooperative body	0.5612	0.2205	0.031***
Sources of improved seed	2.102	0.239	0.578**
Off Farm Income	2.017	1.215	0.029**
Value of farm output of farmers in naira (N)	2.0241	1.0513	1.032*
Mobile Network coverage	0.142	0.275	.102***
Land Ownership Type	0.371	0.251	0.312*
Access to power source	0.126	0.142	1.482
Contact with extension agent	2.864	1.086	0.492*
Distance to improved Seed/Selling Point	-0.037	0.094	0.097*
n = 800			
LR test (ρ=0)	χ 2 (1) =175.24**		
Pseudo R^2	0.34		

*** = significant at 10% probability level

** = significant at 5% probability level

* = significant at 1% probability level

Source: Computed from the field data by authors.

From Table 4, we noted the four factors negatively influence the decision to adopt modern agricultural inputs. While the marital status of the farmer, distance to input redemption centers and farming experience are negatively significant at the 1 percent level, age of the respondent is significant at the 5 percent level. This can be explained by the cultural challenges faced by most of the young rural female farmers who seldom make decisions

independent of their husbands. This female's adoption of any kind of input is relatively restricted as it is always a function of availability of land, and culturally, many young married women have no land of their own. To this, marriage mostly to the rural young women negatively influences their adoption decision. Also, as their ages increase and it is expected that access to land can be guaranteed through their children; they have become so used to the tradition that adoption of innovation does not appeal to them. The findings equally indicate that, the further the distance to the input center, the more rural people ignore the innovation. Hence in making the decision to adopt the modern agriculture inputs, youth farmers consider the source and distance from their villages.

On the other hand, output of the participant, land ownership type and contact with the extension agents were positively significant at the 1percent. Sources of getting inputs, access to credit, off farm income, household size and educational level of the respondents were significant at the 5 percent level, while only membership of a cooperative body was positively significant at 10 percent. Household size is positive because through the provision of household labour, it influences the decision to adopt even when it may be more labour-intensive. Education helps the farmers with the adequate information and at the right time. Thus, increases in these factors definitely will increase the tendency to adopt modern agricultural inputs by rural youths.

Linking our findings to the context of contemporary issues of youths in Africa, Bloom (2012), agreed that Africa will continue to account for a significant fraction of the global youth population; it is projected that the continent's share of the world's youth population will grow from one-fifth, as it was in 2012, to as high as one-third by the year 2050. The African Development Report (2015) added that the current trends suggest that much of the bulge will be accounted for by countries in sub-Saharan Africa. Whether these youths will be able to successfully join the labour market will have ramifications not only for individual wellbeing, but also for the welfare of broader society across the entire African continent. Meanwhile, farming remains the dominant sector in sub-Saharan Africa which provides employment to most of the people in rural areas and makes significant contributions to the gross domestic product (GDP) and foreign exchange earnings (FAO/CTA/IFAD, 2014). In this study, the summary statistics of analysis suggests that the probability of the rural youth participating in the GESS programme, and adopting new farming technologies is positive, given that the set of hurdles to address in both decisions are the same. However, rural youths

in Nigeria have continued to face challenges related to unemployment, underemployment and poverty (Sarah *et al,* 2010; World Bank, 2014). Previous studies have suggested that inspite of the ample potential of farming to provide income-generating opportunities for rural youths in the country, challenges related specifically to youths' participation in this sector and options for overcoming them are not coherently addressed (Sumberg *et al,* 2012; Woomer *et al,* 2015; Swarts & Aliber, 2013). Table 5 helps to explain the socio-economic characteristics of rural youth farmers across the six geo-political zones of Nigeria.

Table 5. Socio – economic characteristics of the respondents

	Registered Youth Farmers			**Non- registered Youth Farmers**		
Sex	Freq	%	Cum	Freq	%	Cum
Males	345	65	65	200	74	74
Females	185	35	100	70	26	100
	530	**100**		**270**	**100**	
Primary Occupation	.					
Farming	295	56	56	218	81	81
Trading	46	9	64	8	3	84
Palm tapping	10	2	66	15	6	89
Government paid employment	145	27	94	7	3	92
Hunting	34	6	100	22	8	100
	530	**100**		**270**	**100**	
Years of experience						
0- 5 Years	199	38	38	28	10	10
6 - 10 Years	246	46	84	94	35	45
15 Years and Above	85	16	100	148	55	100
	530	**100**		**270**	**100**	
Age of respondents						
Less than 20years	46	9	9	12	4	4
21-30 years	288	54	63	33	12	17
31- 40 years	112	21	84	60	22	39
41 years and Above	84	16	100	165	61	100
	530	**100**		**270**	**100**	
Level of Education						
None	19	4	20	152	56	56
FSLC	246	46	66	86	32	88
WAEC/WASSCE	169	32	89	32	12	100

B.Sc and Equivalent	78	15	98	0	0	100
Post graduate degrees	18	3	100	0	0	100
	530	**100**		**270**	**100**	
Marital Status						
Single	186	35	35	65	24	24
Married	252	48	83	125	46	70
Widowed	24	5	87	41	15	86
Divorced	15	3	90	18	7	92
Separated	53	10	100	21	8	100
	530	**100**		**270**	**100**	
Household size						
1-4 Person	451	85	85	48	18	18
5-9 Person	55	10	95	124	46	64
Above 9 persons	24	5	100	98	36	100
	530	**100**		**270**	**100**	
Farm Size						
Less than 1 Hectare	88	17	17	103	38	38
Between 1-2 Hectares	120	23	39	135	50	88
Between 3-4 Hectares	194	37	76	24	9	97
Between 4-5 Hectares	78	15	91	8	3	100
5 and above Hectares	50	9	100	0	0	100
	530	**100**		**270**	**100**	
.						
Ownership Mobile phone						
Have a set	496	94	94	95	35	35
Uses a neighbors set	34	6	100	45	17	52
Have no access to phone set	0	0	100	130	48	100
	530	**100**		**270**	**100**	
Monthly Income Level						
0 - 50,000	36	7	7	85	31	31
51,000 - 100,000	160	30	37	121	45	76
101,000 - 150,000	84	16	53	43	16	92
151,000 - 200,000	123	23	76	12	4	97
201,000 - 250,000	82	15	92	9	3	100
Above 250,000	45	8	100	0	0	100
	530	**100**		**270**	**100**	
Access to Electric Power Source						
Connected to PHCN	170	32	32	88	33	33
Uses Small Generator	216	41	73	64	24	56
Uses Solar energy source	48	9	82	31	11	68

Uses public charger	68	13	95	18	7	74
No access to power at all	28	5	100	69	26	100
	530	**100**		**270**	**100**	

Source: Computed from the field data by authors.

A look at the social (gender, education), economic (occupation, income, farm size, ownership of mobile phone, access to electricity and power source) and demographic (age, marital status, household size) characteristics of rural youth farmers provide an important understanding of the socio-economic status of rural youth farmers and influential factors that determine their participation in the GESS programme. Table 5 shows that a total of 800 farmers were sampled, 530 are registered farmers while 270 are non-registered famers. The statistics show that men constitute 65 percent of the registered farmers, 74 percent of non-registered farmers while rural women make up 35 percent of the registered farmers and 26 percent of none registered farmers. This gap in registration tends to be due to the cultural practices that force the women to farm under the control of their husbands. Further analysis shows that 75 percent of the registered rural young female farmers are widowed, separated or divorced. This supports FAD (2013) in the perspective that in rural areas, many young divorced mothers have no other livelihood except to migrate to the urban centers to be employed as servants in restaurants. Chinsing and Chasukwa (2012) added that they leave with few of their belongings without any means of social security. Uduji and Okolo-Obasi (2017) suggested that rural youths often associate rural farming with hard physical drudgery, and are disillusioned with the meager opportunities for the rural livelihood, that has created incentives to migrate to cities, leaving the small farms to old men and women; thus worsening an already marked low productivity in rural farming.

Table 5also shows the average age of a registered rural youth farmer to be 26 years with average years of experience to be 7.5 years, while the average age of the non-registered farmer is 34 years with an average experience of 13 years. The analysis shows also that education plays a very important role in the decision to register. It is also worthwhile to note from the analysis that only 4 percent of the registered farmers are illiterate while the illiteracy level among the non-registered farmers is 56 percent. About 94 percent of the registered rural youth farmers have their own mobile phones, while the remaining 6 percent use the phones of their neigbours' children or relatives. Among the non-registered farmers, 35 percent have personal mobile phones, while only 48 percent have no access to mobile phones. This is a

big issue as much as the GESS programme is concern, because the main tool is having and being able to use mobile communication. Nevertheless, this finding is not consistent with Grossman and Tarazi (2014) in the perspective that while most urban Nigerians own their SIM(Subscriber Identity Module) cards and handsets, only about half of Nigerian farmers have their own phones; farmers who share a SIM are unable to use the mobile phone number as a unique identifier, while those who share a handset may not regularly receive messages sent to them. However, the high percentage of 35 having access to mobile phones and yet not registered, shows that beyond having phones, there are still many other reasons why rural youth farmers may not have registered for the GESS programme. The analysis shows that about 60 percent of the registered farmers cultivate from 3hectares and above while only about 12 percent of the non-registered farmers cultivate between 3 and 5 hectares. None of the non-registered farmers cultivate more than 5 hectares. It is also relevant to note that the income of the respondents is a major factor affecting the decision to register. About 7 percent of the registered farmers earn a monthly income of between 0 and 50 000 Naira while 31 percent of the non-registered farmers also earn a monthly income of between 0 and 50 000 Naira.

Table 6. Distribution of respondents by constraints faced in accessing improved agricultural inputs

	Registered Farmers			**Non-Registered Farmers**		
Actual Cost of Modern Agricultural Inputs	**Freq**	**%**	**Cum**	**Freq**	**%**	**Cum**
Available and affordable (low price)	209	39	39	14	5	5
Available and affordable (moderate price)	158	30	69	22	8	13
Available and unaffordable (high price)	105	20	89	42	16	29
Unavailable and unaffordable (high price)	43	8	97	75	28	57
Total lack of information	15	3	100	117	43	100
	530	**100**		**270**	**100**	

Source: Computed from the field data by authors.

Table 6 shows that the introduction of the GESS programmes has increased the availability and affordability of modern agricultural inputs to the registered rural youth farmers who are participating in it. About 69 percent of the registered farmers have access to modern agricultural inputs at least at moderate prices, while only 3 percent of the registered rural youth farmers lack total information. On the other hand, only 18 percent of the non-registered rural youth farmers have access to modern agricultural inputs at least, at moderate cost while

about 43 percent have no access to information at all. This shows that if the information about the GESS programme is properly diffused by the extension agents, the adoption and usage of improved agricultural inputs accessed through the GESS will reach grass root farmers faster. The finding points to Bi (2014) that availability of new technologies can help mitigate the effect of climate change and grow more food with fewer inputs. However, lack of extension services has meant farmers have been unable to access these innovations. Nevertheless, this finding suggests that a younger generation can help introduce new technologies whilst also learning from traditional methods, holding the potential to offer the perfect fusion of new and traditional solutions to some of the GESS challenges in rural communities. The increased use of mobile phones in farming can also help deter young people from stereotypes associated with traditional farming, change their perceptions of rural farming, and ultimately convince them to view the GESS it as an exciting and innovative industry, in line with Mittal and Mehar (2016), Mittal and Mehar (2012), and Mittal and Tripathi (2010).

4.4 Prospects for ensuring food security

Figure 2shows that GESS usage by registered youth farmers has improved the timeliness of getting access to the modern agricultural inputs very early by 30 percent and 15 percent for those that get it moderately early. GESS also reduced late receipt of the improved agricultural inputs by 19 percent, rate of very late receipt by 24 percent and also reduced the percentage of those who never access it by 12 percent. This finding demonstrates the role of innovation in rural farming by promoting the application of ICTs for value chain development.

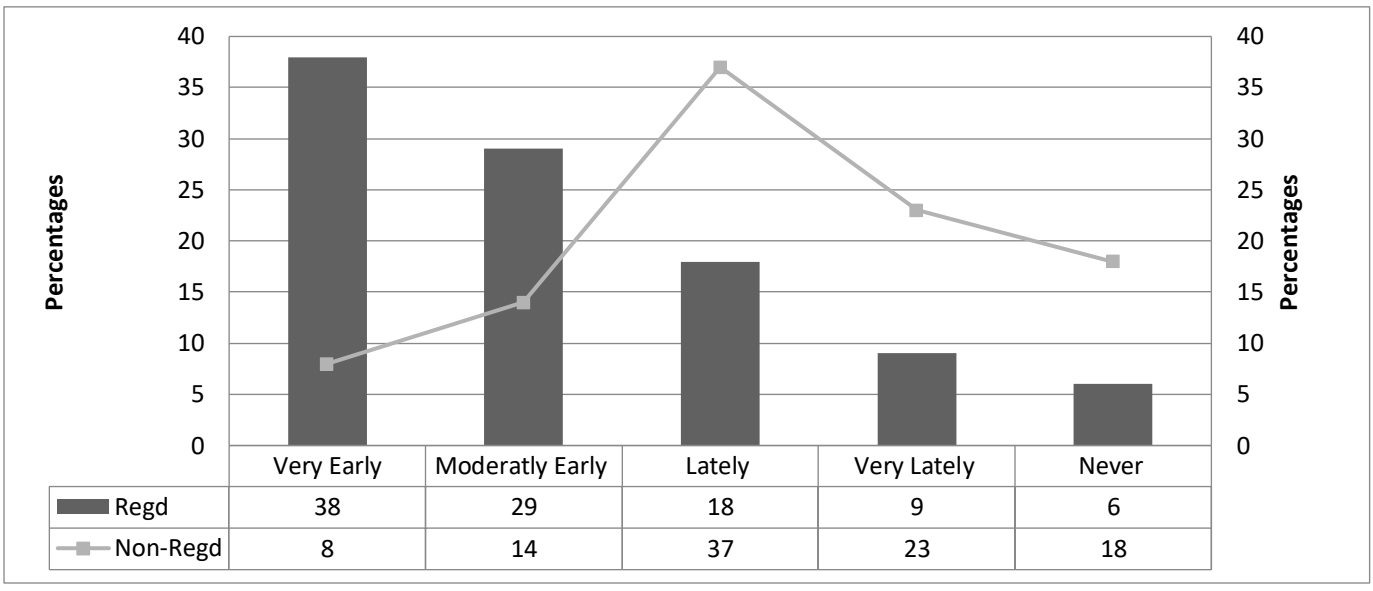

Figure 2. Distribution of respondents by timeliness of getting the improved agricultural inputs
Source: Computed from the field data by authors.

On the whole, the assumption that healthy communities will nurture and support healthy families and individuals holds some truth (Villaruel *et al,* 2003). It is for this reason that this study sees young people as underutilized resources in rural communities of Nigeria. Just as the community youth development theory attempts to highlight the importance of changing the environment within which young people live, this study aimed at achieving Nigeria's agricultural transformation agenda by significantly involving the rural youths to participate in the GESS for their own good, as well as that of meeting human food and nutritional needs in the country. While old male and female farmers are less likely to adopt the new technology needed to achieve the ATA, youths can make valuable contributions with new ideas and perspectives, especially with modern agricultural inputs which will make a difference by growing enough food to feed the world. Thus, if we are to work towards an ideal agricultural transformation agenda for a sustainable increase food security in sub-Saharan Africa, we argue that engaging rural youths in growth enhancement support scheme, should be assigned the highest ATA priority in African food security programmes. Given these realities, it is clear that investing in the next generation of farmers is imperative. Young rural people are the key players that could drive agricultural transformation and combat poverty. ICTs could provide new opportunity for making agriculture more interesting for these young people. It is therefore our contention that African governments hold the key to increase use of mobile phones in farming which can deter young people away from stereotypes of traditional farming and help change their perceptions on agriculture, and also help them view it as an exciting and innovative industry. Hence, embracing policies that give young farmers a chance to participate in farming would offer the young generation a chance to make a difference by growing enough food to feed the world. The young people who become farmers today, have the opportunity to be the generation that would end world hunger and alleviate malnutrition, as well as help the sector adapt to climate change.

5. Conclusion and policy implications

Rural youths are the future of food security, but few see a future for themselves in agriculture or rural areas. As a result, many young people migrate to cities, leaving the farm for old men and women, and thus worsening an already marked low productivity in the farms. Thus, we set out to assess the impact of the growth enhancement support scheme (GESS) on rural

youths' adoption of new technologies needed to sustainably increase food security in Nigeria. Eight hundred youth farmers were sampled across the six geo-political zones of rural Nigeria. Results from the use of a bivariate probit model indicated that the GESS significantly impacts on youth farmers' adoption of new farming technologies (improved seed, fertilizers, crop protection products and other agronomic practices) in rural Nigeria. This suggests that ICT could provide new opportunities for making agriculture more interesting for young people in rural areas. It also suggests that while old male and female generation farmers are less likely to adopt the new farming technologies needed to achieve the Nigeria's agricultural transformation agenda, a younger generation can help introduce new technologies whilst also learning from traditional methods, holding the potential to offer the perfection of new and traditional solutions to some rural challenges. This implies that an increased use of mobile phones in farming can also help deter young people away from stereotypes on traditional farming and help change their perceptions on farming and ultimately enable them to view it as an exciting and innovative industry. The findings prompt that if the federal ministry of agriculture and rural development offers the rural youth education in agriculture and engages them with innovations, then the farming industry can attract youths again to make a difference by growing enough food to feed the world.

However, as those who become farmers now have the opportunity to be the generation that would end world hunger and alleviate malnutrition, as well as help the sector adapt to climate change, studies that offer the rural youth a voice at policy level and in the media, are worthwhile to complement this study. The main caveat of the study is that it is limited to the scope of rural areas in Nigeria. Hence, the findings cannot be generalized to other African countries with the same policy challenges. In the light of this shortcoming, replicating the analysis in other countries is worthwhile in order to examine whether the established nexuses withstand empirical scrutiny in different rural contexts of the African continent, especially sub-Saharan Africa.

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