



Research article

Agricultural transformation, youth participation and food security in Nigeria

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Abstract: This study examines how the agricultural transformation will stimulate youth participation, thereby leading to food security in Nigeria. Information and Communication Technology (ICT) adoption, insurance and health care provision was used as transformation variables. The study applied the Propensity Score Matching (PSM) model on the data sourced from Wave 4 (2018/2019) of the Living Standard Measurement Study-Integrated survey on agriculture (LSMS-ISA). The result showed that; agricultural transformation using ICT, insurance, and health care provision is positive and statistically significant in explaining the level of food security in Nigeria. Therefore, the study concludes that the transformation of Nigerian agriculture should focus on the provision of household's safety net programmes such as insurance. Also, there is a need for the enhancement of households' access to mechanisation services, access to quality and affordability of agricultural input materials to increase productivity, thereby leading to food security.

Keywords: agriculture; food security; ICT adoption; insurance; youth

1. Introduction

Agricultural transformation is a priority in the policy agenda of African governments in their quest to meet the challenges of food and nutrition insecurity, youth unemployment and overall economic growth and development [1]. With right policies, innovation and investment, the continent's agriculture could be transformed into a powerhouse, not only to feed a growing population but to create decent employment for the youth [1,2]. The foundation for transforming the agricultural sector in

Nigeria is to provide safety net coverage such as insurance, health care provision, access to credit among others [2,3]. These safety-net programmes will serve as shock and risk mitigation, thereby leading to increased productivity and food security.

The problem of food insecurity is not only limited to developing countries, but it is a problem faced by developed countries as well. The proportion of the prevalence of malnutrition and people who suffer from food insecurity are found more in rural areas of the developing countries [4]. For a country to be food sufficient there is the need to make food available, provide easy access to food at any given time, and provide households with the ability to afford staple food [5]. It is increasingly obvious that technological investment in agriculture has a very pivotal role to play to ensure that food is available, thereby serving as a major source of income, which enhances households' purchasing power to buy food that has a high rate of nutritional status [6].

Food security may easily be achieved when the youth are encouraged to participate in agricultural activities using mechanised implements, having access to agricultural credit facilities, the provision of safety nets as well as health care facilities for farmers. All these will help transform the agricultural sector, increase productivity and ensure food security [7,8]. This is because youth constitute the more significant share of the world's total population (about 40%) with approximately 60% of the overall population in Africa. By 2030, it is estimated that the African youth population will of no doubt rise by 45% [9,10].

Given the importance of the agricultural sector to the African economies, as it contributes more than 40% of the Gross Domestic Product (GDP); however, agriculture has largely remained unattractive to the populace, especially, the youth, for reasons that include: low return, low investments in infrastructure necessary for efficient value chains development, and inadequate social protection. However, there are emerging success stories of changing attitudes among the youth in undertaking agriculture as a business. The export of agricultural commodities is the primary source of Africa's external trade, in which about US \$6 billion is generated, equivalent to approximately 16.3% of the tangible and intangible commodities exported from the continent [7,10,11].

The rationale for this study arises from the need to transform the Nigerian agricultural sector through safety net programmes such as insurance and health-care provision. The argument is that given this safety net coverage, the youth will be willing to participate in agriculture, which will stimulate productivity and food security in the long-run. This study consists of five sections; section two contains insight from the extant literature. Section three explains the study's methodology; section four presents the empirical results and interpretations, while section five concludes by proposing measures that will help enhance food security in Nigeria.

2. Literature review

Despite being an essential sector in African economies, the potentials of the agricultural sector are mainly under-exploited [12,13]. Ehui and Tsigas (2009) utilised the Global Trade Analysis Project (GTAP) framework to analyse the rate of return from agriculture and found that an improvement in agricultural technology use and the agricultural labour force in Nigeria yielded higher returns on investments than any other sector of the economy, with high potential for job creation [14]. Ayinde (2008) assessed the connection between growth in agriculture and the levels of unemployment in both rural and urban areas in Nigeria. The study reveals that the demand for agricultural employment

decreases as agricultural growth increases, while urban unemployment increases agricultural production as more people seek their livelihoods in agriculture.

Fawole and Ozkan (2019) using 180 samples of respondents' from Ondo, Oyo and Osun States, Nigeria, examined the willingness of unemployed graduates to participate in agriculture in South-West Nigeria [15]. The result of the logit regression model showed that educational status, marital status, gender, possession of agricultural training, employment status of respondents as well as the conducive environment are key factors that can motivate unemployed youth to participate in agricultural activities. However, in Ghana, Acheampong et al. (2018) examined the motivation for community participation in forest management in the Sefwi-Wiawso forest district of Ghana [16]. The result of the 200 unemployed youth analysed through descriptive, chi-square and thematic method revealed that lack of interest and passion for agriculture; been busily looking for other 'better' jobs; historical losses by youth and family members in agriculture; land access challenges; and financial constraints are factors impeding unemployed youth in participating in agriculture.

Baah-Acheamfour et al. (2014) assessed the increase in soil carbon and its stability in three agroforestry systems in central Alberta, Canada [17]. The result of the study showed that provision of land and agro-inputs, the extension of agricultural services and agribusiness management training encouraged the receivers to partake in the youth in the agriculture programme. Oyakhilomen and Zibah (2014) using the autoregressive distributed lag (ARDL) approach to co-integration, examine the effect of agricultural production on growth in Nigeria [18]. The result showed that there is an increase in the poverty rate in the country despite the significant positive influence of agriculture on economic growth. This implies that Nigeria's economic growth is yet to translate to better well-being of a substantial proportion of the population, especially those in the rural areas.

With the endeavour to know what sub-sector of agriculture offers more market opportunities in low-income countries, Kareem and Akinbile (2015) examined the perception of agricultural transformation agenda in commercial rice production in southwest Nigeria with particular reference to Ogun State (four administrative zones of which Egba was selected) and Osun State (six administrative zones of which Ilesa and Iwo zones were selected) [19]. Using descriptive statistics, showed that a more substantial number of farm families alleged that there was a significant improvement in their production of rice through the contribution of agricultural transformation agenda. Education, as well as access to credit, also influenced the perception of farm families to agricultural transformation agenda [19].

Considering the efforts made by sub-Saharan Africa (SSA), McCullough (2017) [20] explored the structural transformation in terms of labour allocation and labour productivity. Agriculture is the sector that employed the most labour in the selected SSA countries, but the sector engages labour least productively. This is because agricultural workers supply fewer labour hours per year compared to workers in other sectors. Using Nigeria as a case study, Nchuchuwe and Adejuwon (2012) [21] examined the challenges of agriculture and rural development in Africa. The study identified inadequate research funding, low level of agricultural productivity, inadequate and insufficient infrastructural facilities, increase in rural poverty, use of traditional technologies, hostile policy and regulatory environment, weather, the fragile connection between agriculture and other sectors.

In a study by [3] which examined food security and agricultural credit facilities in Nigeria using the autoregressive distributed lag (ARDL) technique, found that commercial banks' credit and Agriculture Credit Guarantee Scheme Fund (ACGSF) increased food security while population reduces food security. In line with [21,22], Downie (2017) pointed out that the lack of competition for

the agricultural business, poor factors of production, poor access to market and credit facilities, neglected research system in agriculture as well as unenthusiastic political obligation are some of the challenges encountered in the agricultural sector. [22] concluded that the agricultural sector has the prospect and tendencies to increase growth rate as well as expand the number and diversity of jobs in the sector through eye-catching ways to farming and diversification of the sector; thus, creating the need to focus on the agricultural sector.

The ability of the agricultural sector to increase the quantity and quality of agricultural products through youth engagement has been on the deficit in low-income countries [12,23,24]. Akinnifesi (2013) focuses on multi-pronged solutions to address the skills deficit, obsolete technologies, and limited income creation opportunities in rural areas of Africa [25]. The south-south cooperation (SSC) mechanism is found to have a considerable potential to improve agricultural productivity, income and competitiveness in Africa. This, in turn, will create incentives like higher incomes for youth engagement in agriculture; else, the development agenda into the future may remain bleak for African countries. Matthew et al. (2019) examined agriculture and social protection for poverty reduction in ECOWAS using the Generalised Method of Moments (GMM) econometric technique [7]. The study found out that a positive relationship exists between agriculture value-added, employment, inequality and poverty while social protection and literacy level had a negative association with poverty reduction.

3. Methodology

3.1. Data and sample

Bearing in mind that over the years, the data for the agricultural sector in various countries, especially the African countries evolves with inadequacy, significantly, the inaccuracy in capturing households in the rural communities; for this reason, the LSMS-ISA partners with the national statistics offices of some African countries in formulating a survey system to measure different areas of agriculture effectively. The main aim of this partnership is to accelerate an innovative and proficiency in statistical exploration on the relationships between agricultural transformation, employment generation, and poverty reduction in Africa. The agricultural data from the Living Standard Measurement Study Integrated Survey on Agriculture (LSMS-ISA) covers areas such as the various species of the crop planted (post-planting seasons) by farmers, how these crops are harvested (post-harvest) and farmers' access to agricultural input materials.

The LSMS-ISA is used in studies like [6,26]. The LSMS is a household survey programme under the unit survey of the World Bank Development data, which assist in providing the required technical assistance to the various national statistical offices across various countries of the world to structure and implement various multi-topic household surveys [6]. The study only used the LSMS-ISA data for Nigeria Wave 4 (2018/2019) for the analysis. This comprises of about 5000 agricultural households across the six geo-political zones, 37 states (including the Federal Capital Territory, Abuja) and the 774 Local Government areas.

This study focuses on youth. Though, there are different definitions of youth; however, in this study, and given the peculiarity of the economy of the study area, the definition of youth is based on the African Union (AU)'s definition of youth, which is referred to people within the age bracket of 15 to 35 years old [27,28]. In the LSMS-ISA data; we disaggregated the youth sample from the entire population for the analysis using the household identification.

3.2. Theoretical framework and empirical model

The model for this study is hinged on the Random Utility Theory (RUT). The RUT elucidates some of the reasons while the individual takes part in an event or consume a given level of a commodity. This is will only happen when the utility of participation is higher than otherwise. Given that youth are rational, will only participate in agriculture if there is a transformation in this wise, agricultural transformation aims to enhance participation. Assuming that the utility of youth to take part in agriculture, given that the sector is transformed is $[u_{i1}]$. On the other hand, assuming that the utility of youth not taking part in agriculture, given that the sector is not transformed is $[u_{i0}]$; Nevertheless, since the utility cannot be observed, the utility that a farmer i derived from taking part in agriculture when the sector is transformed and other covariates is said to be j shown in (1):

$$U_{ij} = AgricTransf_i \phi_j + H_{ij} + e_{ij} \quad j = 1, 0; i = 1, 2 \dots, k \quad (1)$$

Where $AgricTransf_i$ stands for transformation variables, ϕ_j is the parameter, H stands for other covariates that will spur youth participation, and food security e_{ij} stands for the white noise. Therefore, following the RUT, the implicit form of the model is specified in equation (2):

$$Foodsec_{ij} = f(AgricTransf_{ij}, H_{ij}) \quad (2)$$

Where $Foodsec$ means food security (the dependent variable); subscript i standards for a youth; j ($f=1,2$) representing gender (male or female). $AgricTransf$ means agricultural transformation (ICT adoption and health-care coverage). H means a vector of youth characteristics and other covariates such as level of education, marital status, gender, labour hour, labour wage.

Given that $Foodsec_{ij}$ is food security, equation (2) is respecified explicitly as presented in equation (3):

$$Foodsec_i = \phi_0 + \phi_1 AgricTransf_i + \phi_2 H_{1i} + \dots + \phi_k H_{ki} + e_i \quad (3)$$

Where: $E(u_{ij} \setminus AgricTransf_{ij}, H_{1ij}, \dots, H_{nij}) = 0$ representing the assumption of the conditional means of the ordinary least squares (OLS)]. This implies that the expected estimates of $Foodsec_{ij}$ is a linear function of the exogenous variables:

Where, the probability (P) of the agricultural sector to be transformed; that is, when the farmers have access to safety-net coverage such as insurance and health is named as “success” shown as; $P_{ij} \rightarrow Foodsec_{ij} = 1 (P_{ij} = \Pr (foodsec_{ij} = 1))$. On the other hand, the probability that the sector will not be transformed is “failure” which is given as $1 - P_{ij} \rightarrow Foodsec_{ij} = 0 (1 - P_{ij} = \Pr (Y_{ift} = 0))$.

The analysis is done using the Propensity score matching (PSM) where the estimate of the coefficient of agricultural transformation, the impact of transformation variables such as ICT innovation and health care coverage on food security. Using the PSM, one of the assumptions is the similar support condition, which considered the prospect that for each value of “ H ”; there is a direct chance of each household being with or without agricultural transformation. The variables included in the analysis are; food security (the outcome variable) captured by the number of households (HH) who were unable to eat healthy and nutritious/preferred food in the last 30 days; insurance (the key control variable) captured by HH member where is covered by any insurance in last 12 months, ICT adoption/usage (treatment variable) captured by HH who used a mobile phone to receive E-wallet fertiliser and improved seed information.

Health service provision is captured by how much did [in naira] pay out of own pocket by households for health services received. Labour hour captured by the number of hours per day did a hired labour work on the plot. Labour wage measured by how much [in naira] household pay per day to the hired workers. Production is measured by how much [crop] in total did HH harvest from [cop] (Quantity), gender (female = 0, male = 1); Educational level is measured by the highest educational level completed by HH.

4. Results and discussion

This section of the study presents the results obtained from the econometric analysis using the Propensity score matching (PSM), as shown in Table 1. The PSM estimates are presented using the logit regression model (Table 1). From the result, across the model, insurance was found to be statistically significant and positive in explaining the level of ICT adoption. This result implies that the provision of insurance to farming household would increase health status. Being in good health invariably increases the chances of ICT adoption, thereby leading to food security. In Table 1, the average treatment on the treated (ATT) showed that ICT adoption and health provision are statistically significant in explaining the level of food security in Nigeria. This is similar to the findings of [29–31] using the PSM approach, found that ICT-mobile phone usage significantly improves agricultural productivity in Ghana. Specifically, according to [29], ICT-mobile phone usage enhances household yields by at least 261.20 kg/ha per output season.

Table 1. The logit regression for PSM (outcome variable: food security).

Variable	Health services as a treatment			ICT Adoption as a treatment		
	Coefficient	Standard Error	P-value	Coefficient	Standard Error	P-value
Constant	-1.5001***	0.7499	0.045	-1.5618**	0.8429	0.064
Insurance	0.5036**	0.24203	0.037	0.3849***	0.2686	0.015
Labour hour	0.01545	0.1952	0.427	0.0065	0.1320	0.622
Labour wage	-9.2605***	0.0003	0.076	-0.0003**	0.0004	0.048
Gender	0.3848	0.2686	0.152	0.00243	0.0002	0.765
Marital status	0.2859	0.3239	0.377	2.034	0.982	0.872
Level of Education	0.3412	0.0265	0.431	0.9123	0.2112	0.1702

Source: Authors' Computation, 2020. Note: *, **, and *** means that the coefficients are statistically significant at 1%, 5% and 10% levels respectively. Source: Authors.

Also, the study engaged the matching quality to examine the group mean and median comparisons to check the extent to which the differences in the characteristics across groups (treatment and control) are reduced as a result of the matching process. The difference in pre-intervention characteristics is balanced after matching, and an appropriate counterfactual outcome derived. In Table 2, these differences are reported as unmatched and matched for both the total sample and the sub-sample of households with ICT adoption and those without ICT adoption.

Table 2. Impact of ICT and Health on Food Security.

Variable	Sample	Treated	Control	Difference	S. E	T-stat
Food Security	Unmatched	1174.7525	1131.2391	43.5133	390.1545	0.1100
Health	ATT	1179.4989	257.5798	921.9191	278.9305	3.3100
Variable	Sample	Treated	Control	Difference	S. E	T. Stat
Food Security	Unmatched	1.98166	1.9833	-0.00172	0.0518	0.3300
ICT	ATT	1.98162	2.0000	-0.01837	0.00417	4.4000

Source: Authors' Computation, 2020.

5. Conclusion

The motivation for this study stemmed from the fact that the Nigerian agricultural needs to be transformed with appropriate policies for youth participation and food security. Therefore, agricultural transformation should focus on the enhancement of households' welfare, provision of insurance, access to ICT facilities, access to mechanisation services; enhance farming households' access to quality and affordable agricultural inputs. For example, delivery of quality fertiliser and seedlings, increase in the efficient delivery of water resources and management systems, including irrigation.

The study applied the PSM model on the data sourced from the Wave 4 (2018/2019) LSMS-ISA, and result show that transformation variables such as ICT adoption, insurance, health care provision are positive and statistically significant in explaining the level of youth agricultural participation and food security in Nigeria. Therefore, based on the findings, the study recommends that; first, the Nigerian government should provide health care services and insurance for farmers. If these benefits are put in place, it will encourage the youth to participate in agricultural activities. This will help to increase agricultural output and in turn, sustainable food security. Second, the government should also encourage the farmers to practice agriculture using technology-based equipment, via giving the farmers soft loans to acquire this equipment. Third, the youth should be encouraged to practice agriculture as this will help to reduce the unemployment rate in Nigeria. For future research, other studies can examine the impact of pastoralists-farmers conflicts as a threat to food security in Nigeria may be taken up, given data availability.

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