agriculture

MDPI

Article

Assessing the Impact of Youth-in-Agribusiness Program on Poverty and Vulnerability to Poverty in Nigeria

Lateef Olalekan Bello [1,2,3,*], Lloyd J. S. Baiyegunhi [1], Gideon Danso-Abbeam [4,5], Adebayo Isaiah Ogunniyi [6], Kehinde Olagunju [7], Tahirou Abdoulaye [3], Victor Manyong [8], Zoumana Bamba [9] and Bola Amoke Awotide [3]

1 Discipline of Agricultural Economics, University of KwaZulu-Natal, Pietermaritzburg 3209, South Africa; baiyegunhil@ukzn.ac.za
2 Department of Global Agricultural Science, The University of Tokyo, Tokyo 113-8657, Japan
3 Social Science and Agribusiness, International Institute of Tropical Agriculture (IITA), Bamako 91094, Mali; t.abdoulaye@cgiar.org (T.A.); b.awotide@cgiar.org (B.A.A.)
4 Department of Agribusiness, University for Development Studies, Tamale P.O. Box TL 1350, Ghana; dansoabbeam@uds.edu.gh
5 Disaster Management Training and Education Centre for Africa, University of the Free State, Bloemfontein 9300, South Africa
6 International Fund for Agricultural Development (IFAD), Abuja 90021, Nigeria; a.ogunniyi@ifad.org
7 Department of Agri-food Economics and Trade, Poznan University of Life Sciences, 60-637 Poznan, Poland; olagunjukehindeoluseyi@gmail.com
8 Social Science and Agribusiness, International Institute of Tropical Agriculture (IITA), Dar es Salam 34441, Tanzania; v.manyong@cgiar.org
9 International Institute of Tropical Agriculture (IITA), Country Representative, Kinshasa 4163, Congo; z.bamba@cgiar.org
* Correspondence: l.bello@cgiar.org

Abstract: Poverty persists in many developing countries, including Nigeria, owing to inadequate infrastructure, unemployment, or poor working conditions, among other factors. Youth poverty and vulnerability to poverty have been identified to prevalent among the young population. Using an endogenous switching probit regression approach, in this study, we evaluated the impacts of youth participation in agribusiness programs (YIAPs) on poverty and vulnerability to poverty in Nigeria. Our findings revealed that some demographic and institutional factors significantly influence poverty and vulnerability to poverty among youth. The impact estimates indicate that participation in an agribusiness program has a significant positive effect on poverty reduction among youth. Moreover, there would have been about a 28% reduction in exposure to future poverty for non-participants had they participated in a YIAP. Our results suggest that intervention programs, such as YIAPs, that focus on skill acquisition and youth empowerment should be strengthened and scaled-up in order to improve youth welfare and subsequently reduce/eradicate poverty and vulnerability to poverty among youth.

Keywords: poverty; youth; agribusiness program; endogenous switching probit regression; Nigeria

check for updates

Citation: Bello, L.O.; Baiyegunhi, L.J.S.; Danso-Abbeam, G.; Ogunniyi, A.I.; Olagunju, K.; Abdoulaye, T.; Manyong, V.; Bamba, Z.; Awotide, B.A. Assessing the Impact of Youth-in-Agribusiness Program on Poverty and Vulnerability to Poverty in Nigeria. *Agriculture* **2022**, *12*, 735. https://doi.org/10.3390/agriculture12050735

Academic Editor: Wojciech J. Florkowski

Received: 10 March 2022
Accepted: 29 April 2022
Published: 23 May 2022

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.

1. Introduction

In developing countries, youth unemployment is a problem, and it has received increasing attention in policy dialogue in recent years. Africa, in particular, faces difficult conditions to accelerate rural economic growth that is sufficient to create jobs, along with a fast-growing youth population. The African Youth Charter defines youth as those between the ages of 15 and 35 [1], accounting for approximately 17.6% of the global population. Many studies, e.g., [2–6], have noted that young people, especially in sub-Saharan Africa (SSA), are now at the epicenter of a major economic crisis, limiting their ability to improve their social and economic status, as well as their prospects for the future. Some studies [7,8] have suggested that youth unemployment is a significant driver of poverty and vulnerability to poverty in many developing countries.

For instance, Nigeria has a population of more than 200 million, with 55.4% of the population either unemployed or working in low-wage jobs [9,10]. As a result of rising unemployment, which is creating a pathway to poverty and vulnerability to poverty, young people are engaging in illegal activities or risking their lives to migrate illegally to wealthy countries in search of better opportunities [11]. Rural–urban migration within the country is also persistent due to differences in access to livelihood assets. As opined by Marcysiak and Prus [12], the occupational structure in rural settings is characterized in such a way that rural inhabitants must decide between generating scarce rural income or relocating/travelling a far distance to find employment in urban areas. However, Akande [13] noted that due to persistently high rates of youth unemployment over the last two to three decades, urgent policy and program reforms have become imperative, especially within the agricultural sector.

As a result, the Nigerian government has made several efforts to stimulate youth interest in agricultural production and processing. There have been various agricultural development projects in Nigeria over the years to enhance rural livelihoods, generate jobs (especially for young), and assure food security. For the purpose of assisting young people in agricultural industries, such as crop and animal production and agro-processing, by providing training and setting up businesses, the Youth-in-Agribusiness program (YIAP) was created. The Fadama youth empowerment program and the Ogun Women and Youth Empowerment Scheme (OGW-YES) were implemented as part of the YIAP. The Fadama–YIAP effort was supported by the federal government and the Ondo state government, whereas the OGW-YES program was funded by the Ogun state government of Nigeria [11]. The YIAP targeted different categories of youth (male and female, graduate and non-graduate) interested in agriculture. Youths were selected across all local government areas (LGAs) in the state. Selected youths were trained and provided start-up capital for their respective agribusiness.

Whereas many empirical studies have investigated the impacts of youth participation in agriculture on outcome variables, knowledge gaps regarding certain aspects still exist in the literature. For example, Fawole and Ozkan [14] found that most youth were willing to engage in agriculture when a favorable and enabling environment for agribusiness was provided. The study showed that unemployment could be reduced if 22% of the country's unemployed youth were employed in agriculture. Lyocks et al. [15] revealed that the absence of suitable incentives, poor agricultural skills and training, limited access to funds, and poor agricultural prospects discouraged young people from getting involved in farming. Other studies have also focused on the perception of youth in agribusiness [16,17], as well as the technical efficiency of youth participation in agriculture [18]. Bello et al. [11] analyzed the impact of YIAP on employment creation among youth in Nigeria. Their study showed that YIAP had a substantial impact on creating employment for Nigerian youth. Osabohein et al. [19] also studied the nexus between youth participation in agriculture and poverty reduction. Their study found that youth participation in agriculture contributes to about a 17% reduction in poverty in Nigeria. However, two shortcomings were identified in their studies, such as the use of per capita income as an indicator of poverty and the study's failure to estimate the treatment impact on vulnerability to poverty. The use of income as a measure of poverty only reflects the opportunity to reach a particular welfare level and not achievement of a certain level of well-being. It is also critical to recognize the differences between poverty and vulnerability. The former is more concerned with one's current well-being, whereas the latter is more concerned with one's future well-being [20]. Thus, estimating poverty without recourse to vulnerability to poverty might lead to inadequate information for future design and implementation of agriculture-related programs.

The contributions of the present paper to the literature and policy decisions are twofold. First, our study differs from existing work by estimating the impact of YIAP not only on poverty reduction but also on vulnerability to poverty among Nigeria's youth. Understanding who is poor and who is at risk of becoming poor is critical for developing and implementing effective pro-poor policies. Effective poverty and the uncertainty surround-

ing people with poor welfare accomplishments need to be considered by policymakers when making decisions in order to avert future levels of poverty. Secondly, analyzing the decision to participate in an intervention program such as YIAP using cross-sectional data with non-randomized control experiment is most likely to face the challenges of self-selection bias and endogeneity. Self-selection bias occurs because the participants voluntarily decide to participate in the YIAP program, and therefore, their decision can be observed only by a restricted, non-random sample. The voluntary decision of the youth to participate in the program may be influenced by factors that cannot be directly measured by researchers in the field (unobserved factors), such as youth motivation, innate skills, risk preferences, and managerial skills, among others. These unobserved factors have the potential to cause a change in poverty status and potential to become poor. Another important challenge associated with using observational data to estimate the impact of a treatment (YIAP) on outcome variables (poverty status and vulnerability to poverty) is missing data. The issue of missing data is critical because it is not feasible to estimate the impact of YIAP on the poverty status of the same person at the same time, as every youth in the sample is either a participant or a non-participant in the program and not both. Therefore, we cannot observe the poverty status of the target youth if they had not participated in the YIAP program at the same time. Thus, the poverty status and vulnerability to poverty of the sampled participants can be estimated in one state at a time. This study contributes to the existing literature by applying an endogenous switching probit (ESP) modelling technique to control for estimation issues that may arise from both observed and unobserved heterogeneities in household characteristics. ESP also adequately addresses the challenge of missing data and therefore provides consistent estimates that mimic the true impact of the YIAP.

2. Materials and Methods

2.1. Study Area and Data Collection Techniques

This study used the data collected from Southwest Nigeria. The states (Ogun and Ondo) selected for this study are among the major crop producers in Nigeria. The occupation of the inhabitants are mainly farming. They produce cash and food crops such as oil palm, cocoa, rubber, rice, cassava, rice, cowpea, etc. Other agro-allied business such as animal production and food processing, is predominant in the study area. As stated earlier (in Section 1), the YIAP is targeted in this region to encourage and support youths to take up agribusiness. This will enhance the employment opportunities for the youth, boost agricultural production and reduce rural-urban migration by the young people. Therefore, we focused on these two states based on the potential YIAP attributes.

The primary aim of the survey data was to get information about the status quo of youth participation in agribusiness and the welfare impacts of YIAP participation. The study used both quantitative and qualitative approaches for the survey data. As posited by Bless et al., [21] using two or more techniques for data collection allows triangulation of information obtained from the respondents. Combining both qualitative and quantitative approaches helps to give a detailed inference based on the statistical analysis and information (interviews) obtained from the field. The quantitative approach involved the use of a structured questionnaire uploaded unto "Surveybe" computer application (coded questionnaire) to collect information on the youth. The information collected includes demographic, farm-specific variables, assets holdings, expenditure on food and non-food items, etc. The qualitative information was collected through focus group discussions, where a wide range of issues pertaining to YIA, poverty and vulnerability to poverty were discussed. Enumerators who are familiar with the YIAP and fluent in the local language of the youths were trained and recruited for the data collection. The enumerators comprised of states extension agents and university graduate students in the faculty of agriculture. The extension agents were parts of the facilitators of YIAP, while the students have full knowledge of YIAP. The enumerators were trained by the researcher (first author) on the administration of the questionnaire, survey device and other survey technicalities for a

week. After the training, the questionnaire were pre-tested to ensure the validity of the data. We selected 60 youth farmers (participants and non-participants) from the two states (30 in each state) for the pre-test. A slight modification was made to the questionnaire after the pre-test.

A multistage random sampling was adopted in selecting the youths. The youth selected for this study are between 15–35 years because this is the considered age group of youth in Nigeria [11]. Firstly, we choose purposively two states (Ondo and Ogun) in Southwest Nigeria where YIAP has been conducted in the past. A list of youths (location inclusive) who participated in YIAP was obtained from the agriculture ministry. With the assistance of the officials of the Ministry of Agriculture in both States, we were able to select seven local government areas (LGAs) where YIAP has been conducted. The third stage involves the random selection of five communities in each LGAs. Finally, we selected 5–10 participants and non-participants youth of YIAP, leading to a selection of 668 youth farmers for the study. The sample size was calculated using Cochran's [22] sample determination procedure, with a 95% confidence range and a 5% margin of error. The sampling procedure yielded a self-weighing representative sample that had the same chance of picking every youth farmer in the study region. The youths in the study area engaged in different agribusiness enterprises such as crop and animal production and agro-processing. The map of the study area is shown in Figure 1.

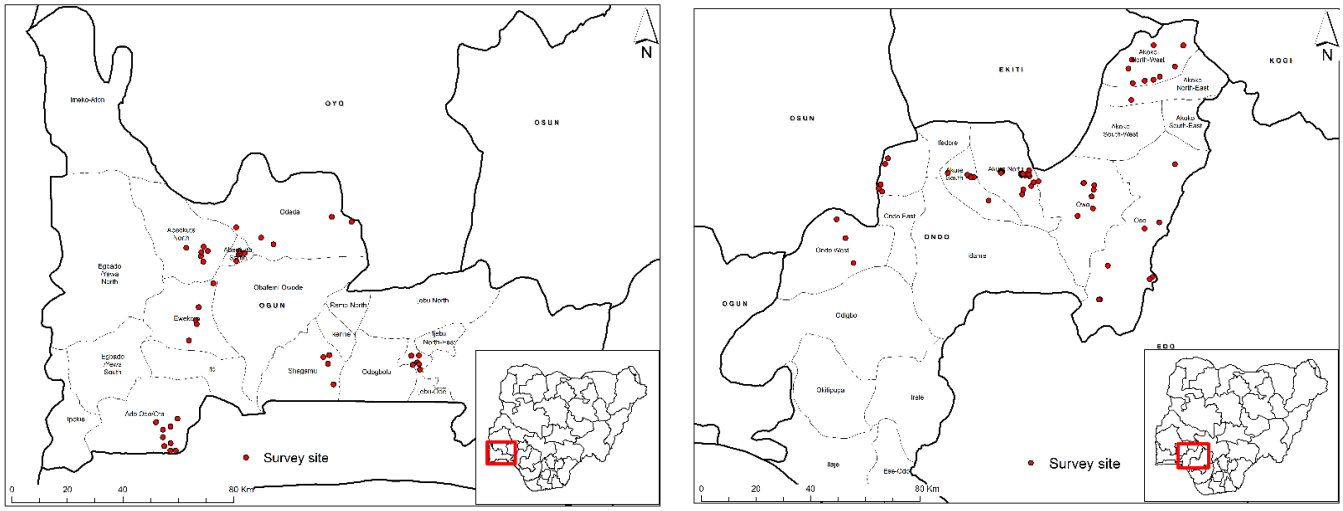

Figure 1. Study area map indicating sampled youth GPS coordinates. Source; IITA-GIS UNIT.

2.2. Conceptual Framework and Estimation Strategies

In this study, we model participation in YIAP in a random utility framework to estimate causal effects of YIAP on poverty and vulnerability to poverty among the youth. Under this framework, youth participation in YIAP is a decision based on a utility maximization function. The expected net benefit or utility derived from participating in YIAP, B_P, is compared to that of non-participation utility, B_N. Therefore, a utility-maximizing youth will participate in YIAP if and only if $Q^* = B_P > B_N$. Q^* is a latent variable that defines the expected utility from the participation decision, which can be specified as:

$$\begin{cases} Q^* = \varpi Z + \xi \\ Q^* = Q = 1 \text{ if } Q^* > 0 \\ Q^* = 0 \text{ if } \varpi Z + \xi \leq 0 \end{cases} \quad (1)$$

Equation (1) represents the participation model, where Q, a dummy variable, equals 1 if a youth participate in YIAP and 0 otherwise; Z is a vector of independent variables; ϖ is a vector of parameters to be estimated; and ξ denotes the error term.

We computed the poverty status of the sampled youth by comparing their consumption (food and non-food) per capita expenditure (CPE) to the international poverty line of USD 1.90/day (at the time of survey, USD 1 was equivalent to NGN 365). USD 1.90 was used as a threshold for poverty status (assigning a binary value of 1 for non-poor and 0 for poor). A youth household with a CPE equal to or greater than USD 1.90/day was categorized as non-poor, whereas those with a CPE less than USD 1.90/day were considered poor. CPE is a better measurement of welfare than income in developing countries such as Nigeria due to the variability and unstable earnings of individuals from either paid or self-employment [23]. In this study, it is expected that participation in YIAP should reduce youth poverty status. Thus, poverty status is linked with participation in YIAP and other explanatory variables in a linear function, which can be stated as:

$$P_s = \tau Q + \psi Y + \vartheta \tag{2}$$

where P_s represents the poverty status, Q indicates the decision of youth to participate in YIAP; Y denotes the socioeconomic characteristics of the youth; ψ are parameters to be estimated, and ϑ is the error term. The impact of YIAP participation is measured by the parameter estimates of τ. However, the decision to participate in YIAP might be endogenous because the youth farmers are not randomly assigned to the agribusiness program. This study is based on observational data. Thus, participation in YIAP might depend on both observable and unobservable characteristics of the youth farmers.

Therefore, there might be shortfalls in the accuracy of the estimates of parameter τ for measuring the impact of YIAP participation. Additionally, because the youth unobservable characteristics (such as skills/innate ability) could correlate with the outcome variable of interest (poverty status), i.e., the correlation between the error term (ξ and ϑ) in Equations (1) and (2) would lead to selection biases. Therefore, to account for the issue of endogeneity, we employed the ESPR model for this study. The ESPR controls for both the observable and unobservable factors that might lead to bias estimates of the impact of YIAP on poverty status of the youth farmers. Aside from the endogeneity issue, the ESPR is suitable for this study because of its unique ability to estimate a binary outcome variable (poverty/vulnerability status).

According to Lokshin and Sajaia [24], the ESPR can be estimated in two parts. The first part deals with the probability of participation in YIAP (Q), whereas the second part deals with the binary outcome variable (poor or non-poor). Thus, the outcome equations, conditional on YIAP participation, can be expressed as:

$$\begin{array}{c} Q = 1 \text{ if } \delta D_i + \xi_i > 0 \\ Q = 0 \text{ if } \delta D_i + \xi_i \leq 0 \end{array} \tag{3}$$

$$P^*_{S1i} = \alpha_1 K_{1i} + \vartheta_{1i} P_{S1i} = \mathrm{I}(P^*_{S1i} > 0) \text{ Regime 1 (participants)} \tag{4}$$

$$P^*_{S0i} = \alpha_0 K_{0i} + \vartheta_{0i}\, P_{S0i} = \mathrm{I}(P^*_{S0i} > 0) \text{ Regime 2 (non-participants)} \tag{5}$$

where P^*_{S1i} and P^*_{S0i} are the unobservable variables that determine the binary values of the observed poverty status, P_{S1i} and P_{S0i}, respectively, assigned a value of 1 if the youth is non-poor and 0 if poor; D_i is a vector of explanatory variables that determines a switch between regime 1 and 2; K_{1i} and K_{0i} represent a vector of exogeous variables that explain the poverty status; δ, α_1 and α_0 are vectors of parameters yet to be estimated; and ξ_i, ϑ_{1i}, and ϑ_{0i} are the random disturbances (error terms) assumed to be jointly normally distributed with a mean of zero and the correlation matrix is given as:

$$\Omega = \begin{pmatrix} 1 & \rho_0 & \rho_1 \\ & 1 & \rho_{10} \\ & & 1 \end{pmatrix} \tag{6}$$

where ρ_0 and ρ_1 denote $corr\ (\vartheta_{0i},\ \xi_i)$ and $corr\ (\vartheta_{0i},\ \xi_i)$, respectively; whereas ρ_{10} indicates $corr(\vartheta_{0i},\ \vartheta_{1i})$. An accurate specification of the ESPR requires the inclusion of at least one valid instrumental variable (IV) in the selection (participation) model in Equation (3) and not included in the outcome model, Equations (4) and (5). This means that the IV should influence YIAP participation but not the poverty status. Therefore, we used a social capital variable (membership in a youth organization). It is believed that participation in YIAP occurs through awareness of the program. Thus, youth organization members are mostly aware of intervention programs designed for youth and have a better chance of being selected for such programs. Therefore, being a member of a youth organization can directly influence participation in YIAP but necessarily poverty/vulnerability status (being poor or not). As suggested by Di Falco et al. [25], we tested the instrument's validity by conducting a simple falsification test. The validity test results for poverty and vulnerability to poverty were chi^2 (1) = 98.79 (0.000) and chi^2 (1) = 78.07 (0.000). The test result reveals that membership in youth organizations is a good IV, as it significantly influences YIAP participation but not the outcome model.

2.3. Impact of YIAP Participation on Poverty

The poverty impact of YIAP participation was estimated using the full information maximum likelihood (FIML) framework of the ESPR model. This framework provides efficient impact estimates, as selection and outcome equations (Equations (3)–(5)) are estimated simultaneously to yield consistent standard errors. According to Lokshin and Sajaia [21], the log-likelihood function of the FIML estimator is expressed as:

$$\begin{aligned}\ln(\zeta) = & \sum_{Q_i \neq 0,\ P_{si} \neq 0} \varpi_i \ln\{\Phi_2(\alpha_1 K_{1i},\ \delta D_i, \rho_1)\} \\ & + \sum_{Q_i \neq 0,\ P_{si} \neq 0} \varpi_i \ln\{\Phi_2(-\alpha_1 K_{1i},\ \delta D_i, -\rho_0)\} \\ & + \sum_{Q_i \neq 0,\ P_{si} \neq 0} \varpi_i \ln\{\Phi_2(\alpha_1 K_{1i},\ \delta D_i, -\rho_0)\} \\ & + \sum_{Q_i \neq 0,\ P_{si} \neq 0} \varpi_i \ln\{\Phi_2(-\alpha_1 K_{1i},\ \delta D_i, \rho_0)\}\end{aligned} \tag{7}$$

where ϖ_i is an optional weight for the i th youth, and Φ_2 is the cumulative function of a bivariate normal distribution. In ensuring that the estimated $\rho_1,\ \rho_0$ are bounded between -1 and 1, the FIML directly estimates atanh ρ_j, which is given as:

$$\text{atanh}\ \rho_j = \frac{1}{2} \ln \left(\frac{1 + \rho_j}{1 - \rho_j} \right) \text{j} = 0,\ 1 \tag{8}$$

where ρ_j denotes the coefficient of correlation between ξ_i of Equation (3) and ϑ_i of Equations (4) and (5), respectively. Thereafter, we computed the impact estimates of the average treatment effect on the treated (ATT) and the average treatment effect on the untreated (ATU).

The ATT and ATU can be specified as:

$$ATT_{ESPM} = \frac{1}{N_P} \sum_{i=1}^{N_P} \Pr(\ P_{s1} = 1 | Q = 1,\ K = k) - \Pr(\ P_{s0} = 1 | Q = 1,\ K = k) \tag{9}$$

$$ATU_{ESPM} = \frac{1}{N_P} \sum_{i=1}^{N_P} \Pr(\ P_{s1} = 1 | Q = 0,\ K = k) - \Pr(\ P_{s0} = 1 | Q = 0,\ K = k) \tag{10}$$

where N_P is the number of sampled participants and non-participants of YIAP, respectively; and $\Pr(\ P_{s1} = 1 | Q = 1,\ K = k)$ and $\Pr(\ P_{s0} = 1 | Q = 0,\ K = k)$ are the observed and counterfactual predicted probabilities of poverty status of YIAP participants and non-participants, respectively.

2.4. Modelling Youth Vulnerability to Poverty

The estimation of vulnerability to poverty is important for economic policy guidance, yet it is scarce in the literature. Complementing the poverty status criteria, we evaluated the impact of YIAP on vulnerability to poverty. Vulnerability to poverty is the future probability that a non-poor person will become poor or a poor person will remain poor. Poverty does not only depend on the expected (i.e., mean) consumption of a household but also on the volatility (i.e., variance) of its consumption stream [26]. In this study, we followed Chaudhuri et al. [26], who developed the vulnerability measurement approach known as "vulnerability expected poverty" (VEP) using cross-sectional data (which is similar to our data set). According to Chaudhuri et al. [26], the vulnerability to poverty level of a youth household, $\hbar$, at time t is defined as the probability that a youth household, $\hbar$, will be poor at time $t+1$, which is expressed as:

$$\forall_{\hbar,t} = \Pr(ln\mathbb{C}_{\hbar,t+1} < ln\wp) \tag{11}$$

where $\forall_{\hbar t}$ represents the vulnerability to poverty of a youth household, $\hbar$; $\mathbb{C}_{\hbar,t+1}$ is the per capita consumption expenditure of a youth household at time $t+1$; $\wp$ is the youth household's poverty line; and ln is the natural log.

The CPE of a youth household is derived from several factors, which can be observable and non-observable. Assuming that household per capita consumption expenditure relationship is linear, the influencing factors can be expressed as:

$$ln\mathbb{C}_{\hbar} = \gamma\mathbb{Z}_{\hbar} + \ell_{\hbar} \tag{12}$$

where $\mathbb{Z}_{\hbar}$ is a set of exogenous variables (such as farm-specific and socioeconomic characteristics) of a youth household, γ is a vector of parameters to be estimated, and $\ell_{\hbar}$ is a random disturbance term that depicts household shocks (idiosyncratic factors) distributed normally with mean zero and constant variance. Vulnerability to poverty can be estimated using the coefficient estimates for Equation (12):

$$\hat{\forall}_{\hbar,t} = \Pr(\ln \mathbb{C}_{\hbar,t+1} < \ln \wp | \mathbb{Z}_{\hbar,t}) = \Phi(\ln \wp - \hat{\gamma}\hat{\alpha}\mathbb{Z}_{\hbar,t}) \tag{13}$$

where $\hat{\forall}_{\hbar,t}$ represents the estimated vulnerability to poverty of a youth household, depending on the youth's participation in YIAP and other factors; Φ is the cumulative density of the standard normal; and $\hat{\alpha}$ denotes the estimated standard error from Equation (12).

As opined by Chaudhuri et al. [26], the constant variance assumption might be violated using cross-sectional data because we are ignoring the future uncertainty with regard to youth household CPE, which could depend on the country's economy in the future, resulting in biased estimates. However, the issue of heteroskedasticity might be addressed by linking the linear per capita consumption expenditure deviation to the youth observable characteristics, which is specified as:

$$\sigma^2_{\ell,h} = \alpha\mathbb{Z}_{\hbar} + \mu_h \tag{14}$$

As stated previously, there is a likelihood that participation in YIAP is endogenous; thus, we followed Amemiya's [27] three-stage feasible generalized least square (FGLS) analytical procedure to capture the potential implicit heteroskedasticity using a suitable instrument. The FGLS is estimated using ordinary least square (OLS). The FGLS procedure involves the estimation of Equation (12), followed by using the residuals from Equation (2) to estimate Equation (6):

$$\overset{\wedge^2}{\sigma_{ols,\,h}} = \hat{\alpha}\mathbb{Z}_{\hbar} - \hat{\mu}_h \tag{15}$$

where $\hat{\mu}_h$ is the stochastic error term. The values predicted from Equation (6) are used to transform Equations (4) and (5), given as:

$$\frac{\sigma^2_{\ell,h}}{\hat{\alpha}\mathbb{Z}_\hbar} = \alpha\left\{\frac{\mathbb{Z}_\hbar}{\hat{\alpha}\mathbb{Z}_\hbar}\right\}\frac{\mu_\hbar}{\hat{\alpha}\mathbb{Z}_\hbar} \tag{16}$$

The estimates of Equations (10) and (11) yield an asymptotically accurate FGLS ($\hat{\alpha}_{FGLS}$). The $\hat{\alpha}_{FGLS}$ is an accurate estimate of the idiosyncratic deviation $\sigma^2_{\ell,h}$ CPE component. Employing the $\hat{\alpha}_{FGLS}$, the standard error and the transformed Equation (8), we generate the following:

$$\hat{\sigma}_{\ell,h} = \sqrt{\mathbb{Z}_\hbar\hat{\alpha}_{FGLS}} \tag{17}$$

$$\frac{\ln \mathbb{C}_\hbar}{\hat{\sigma}_{\ell,h}} = \gamma\left[\frac{\mathbb{Z}_\hbar}{\hat{\sigma}_{\ell,h}}\right] + \frac{\ell_\hbar}{\hat{\sigma}_{\ell,h}} \tag{18}$$

Consequently, Equation (18) is generated by dividing Equation (7) by the obtained standard error in Equation (17). Thus, the estimate of γ in Equation (18) is an asymptomatically consistent and accurate coefficient. Using γ_{FGLS} and α_{FGLS}, the estimation of the anticipated consumption per capita expenditure and its deviation is derived using Equations (19) and (20).

$$\mathrm{P}\left\{\left|\frac{ln\mathbb{C}_\hbar}{\mathbb{Z}_\hbar}\right|\right\} = \hat{\gamma}\mathbb{Z}_\hbar \tag{19}$$

$$\mathrm{P}\left\{\left|\frac{ln\mathbb{C}_\hbar}{\mathbb{Z}_\hbar}\right|\right\} = \begin{matrix}\wedge^2 \\ \sigma_h\end{matrix} = \hat{\gamma}\mathbb{Z}_\hbar \tag{20}$$

Lastly, we assumed a normal distribution of the log of per capita expenditure and the vulnerability to youth household poverty, which was estimated as follows:

$$\hat{\forall}_{\hbar,t} = \Pr(\ln \mathbb{C}_{\hbar,t+1} < \ln \wp|\mathbb{Z}_{\hbar,t}) = \Phi\left\{\frac{\ln \wp - \hat{\gamma}_{FGLS}\mathbb{Z}_\hbar}{\sqrt{\mathbb{Z}_\hbar\hat{\alpha}_{FGLS}}}\right\} \tag{21}$$

As posited by Dey [28], the poverty threshold of 0.5 is appropriate in measuring the vulnerability index. Therefore, we adopted this threshold, and a youth household with a vulnerability score of 50% or more is deemed likely to be poor in the near future.

3. Results and Discussion

3.1. Descriptive Statistics of Youth

The descriptive statistics results presented in Table 1 show that the average CPE of the youth households is USD 3.84/day, with YIAP participants having a significantly higher CPE (USD 4.95/day) than non-participants (USD 3.53/day). This signifies that the average youth CPE is above the international poverty line of USD 1.90/day. An explanation for this is that most youth had fewer or no dependents, as they are either at the early stage of their marriage life or single. About 60% of the young individuals are married, with an average household size of two. Youth in rural Africa (including Nigeria) are known to get married early due to different cultural/religious beliefs [7,29]. Thus, this was similar in our study results, as the youths explained that they were encouraged to get married early by their parents. There is a significant difference between the poverty status of participants and non-participants. On average, about 60% of the youth are poor (47% of participants and 64% of non-participants). However, we cannot conclude that the poverty status between the two groups resulted from participation in the YIA program. This is because both observed and unobserved factors were not accounted for. The statistical difference between explanatory variables elucidates the need for an impact evaluation econometric model in which ESPR is suitable in our case. The majority (71%) of the respondents were male. This is not surprising because most agribusiness enterprises are physical and energetic, which suits men more than women. The average age of the youths is 31 years, whereas the

average number of years of education is about 12 years. This implies that the youth have at least high/secondary school qualification.

Table 1. Youth household characteristics by YIAP participation.

Variable	Total Sample (668)	Participants (146)	Non-Participants (522)	*t*-Test
Consumption per-capita expenditure (USD)	3.84	4.95	3.53	−1.88 [c]
Poverty status (1 = non-poor)	0.40	0.53	0.36	−3.64 [a]
Gender (1 = Male)	0.71	0.76	0.69	−1.66 [c]
Age (Year)	31.02	31.08	31.01	−0.15
Education (Year)	12.06	13.50	11.66	−3.60 [a]
Household size (count)	2.30	2.53	2.24	−1.45
Marital status (1 = Married)	0.60	0.60	0.61	0.25
Access to agribusiness training (Yes = 1)	0.74	0.92	0.69	−5.79 [a]
Access to credit (Yes = 1)	0.28	0.47	0.23	−5.73 [a]
Access to extension service	0.26	0.36	0.23	−3.21 [a]
Engage in non-agricultural work (Yes = 1)	0.38	0.51	0.35	−3.50 [a]
Member of youth organization (Yes = 1)	0.32	0.68	0.22	−11.37 [a]
Aware of YIAP (Yes = 1)	0.48	1.00	0.33	−17.06 [a]
Productive asset value (USD)	103.30	239.36	65.25	−4.98 [a]
Location:_Ogun (Yes = 1)	0.50	0.48	0.50	0.37

Source: Authors, 2022. [a] and [c] denote significance level at 1% and 10%, respectively.

There is a statistically significant difference between participants and non-participants of YIAP (92% and 69%, respectively) who had access to agribusiness training. Access to credit is low among the youth. About 28% of the youth had access to credit. However, more participants (47%) had access to credit compared with non-participants (23%). Similarly, young individuals have limited access (26%) to agricultural extension services. Both credit and extension services are essential in agribusiness enterprise. Agribusiness is known to be very capital-intensive; thus young, adults at the early stage of their lives need funds to start up and expand their business. Access to credit, advice, and basic farm services from the agricultural extension service could motivate and enhance youth participation in YIAP. However, there is a significant difference in productive assets (value of owned assets used by the youths for their agribusiness) between participants (USD 239.36) and non-participants (USD 65.25) of YIAP.

Social capital, such as membership in a youth organization, is an important institution in every society, as it provides information and supports youth development. There is a statistical and significant difference among participants and non-participants (68% versus 22%) who are members of a youth organization. Awareness of YIAP is believed to be the first step in participating in the program. Thus, all the participants were aware of YIAP, whereas only about 33% of the non-participants had information about the program.

3.2. Assessment of Youth Vulnerability to Poverty

As stated previously, we used the international poverty line (USD 1.9/day) as a threshold for the poverty status and 0.5 for vulnerability, where $\forall_i$ is vulnerability, $\mathbb{C}$ denotes the consumption per capita expenditure, and $\wp$ represents the international poverty line. Table 2 presents the different decomposed vulnerability and poverty status categories of youth households. The positive and statistically significant value of the Pearson chi-square at the bottom of Table 2 indicates a positive and statistically significant relationship between youth household vulnerability and poverty.

The youth households were categorized into high vulnerability ($\forall_i > 0.5$) and low vulnerability ($\forall_i < 0.5$), as well as non-poor ($\mathbb{C} > \wp$) and poor ($\mathbb{C} < \wp$). The results presented in Table 2 indicate that the majority (about 60%) of the sampled youth households are poor. A large proportion of poor youth households (51 out of 60%) are at high risk of poverty. This means that youth households in this category have a likelihood of lingering in poverty in the future. However, about 9.13% of poor youth households are in the category of transitory poverty (low vulnerability). This implies that these households are currently poor but they have the tendency to escape poverty in the future.

Furthermore, our results indicate that the proportion (40%) of non-poor youth households was below average. However, about 23% of the non-poor households have a high vulnerability to poverty. This suggests that about 23% of the non-poor youth households are likely to experience poverty in the near future. Finally, 16.8% of non-poor youth households have a low vulnerability to poverty. This implies that youth in this category are currently not poor and are not at risk of poverty in the future.

Table 2. Classification and decomposition by youth vulnerability and poverty status.

Vulnerability	Poverty Status		
	Non-Poor ($\mathbb{C}>\wp$)	Poor ($\mathbb{C}<\wp$)	Total
High vulnerability ($\forall_i > 0.5$)	154 (23.05)	341 (51.05)	495 (74.10)
Low vulnerability ($\forall_i < 0.5$)	112 (16.77)	61 (9.13)	173 (25.90)
Total	266 (39.82)	402 (60.18)	668 (100)
Pearson chi2 (1)	*60.498*		
p-value	*0.0000*		

Source: Authors, 2022.

The results presented in this section generally affirm that the average youth farmer in the study area is poor. A plausible reason could be that the majority of youths are involved in small- to medium-scale agribusiness enterprises and have little or no experience.

3.3. Determinants of Youth Poverty and Vulnerability to Poverty

Table 3 shows the results of determinants of YIAP participation (first stage of ESPR) and vulnerability/poverty status (second stage of ESPR) of the sampled youths.

As explained previously, a dummy value of 1 was assigned to non-poor poverty status and 0 for poor poverty status. Thus, a negative sign of coefficient indicates that a variable could increase the probability of being poor/at risk of poverty. In contrast, a positive sign signifies a decrease in the likelihood of being poor/vulnerable to poverty. The ESPR diagnostic test, (ρ_1) and (ρ_0), for the poverty status model indicates a negative and statistically significant correlation between the error term of the participation equation and that of the poverty status for the participants and non-participants, indicating the occurrence of self-selection bias in the data set. The negative sign implies that the participants are more likely to participate in YIAP. At the same time, non-participant youths might have decided not to engage in YIAP because they did not perceive the benefit. The positive and statistical significance of (ρ_1) for the vulnerability to poverty equation suggests a negative correlation between youth who participated in YIAP and exposure to poverty. The *Wald* test of independent equations was significant at a 1% significance level. This indicates that there is mutual dependency between the participation equation and the outcome equation. This confirms the validity and suitability of the ESPR model used in this study.

We found that years of education, access to credit, productive assets, and youth organization membership, are statistically significant and positively influence YIAP participation. '*We did not discuss determinants of YIAP participation in detail because it is not the primary objective of this study*'.

The coefficients of gender, age, and marital status are negative and have a statistically significant influence on YIAP participants' and non-participants' poverty status. This indicates that the older the youth, the higher the probability of being poor. A plausible explanation for this is that older youth might have more financial responsibilities than younger youths. This finding is in tandem with that of Osabohien et al. [19], who found that older youth farmers are more likely to be poor in Nigeria. The negative sign of marital status implies that married youth are more likely to be poor than single youths. Married youths are more likely to have more dependents than unmarried youth because married youth have partners (wife/husband) and probably child(ren). Thus, an increase in the financial dependency rate of young adults could influence the probability of being poor. This finding corroborates the findings of Ogunniyi et al. [30] and Osabohien et al. [19].

Access to credit, extension service, and productive assets decrease the probability of being poor among participants. Most agribusinesses, such as crop and animal production, are known to be seasonal and time-bound. Therefore, access to credit plays a significant role in scaling up an agricultural business, as projects are financed and executed appropriately and for the intended purposes. Such agribusiness tends to generate profit and thus might decrease the probability of the owner being poor. Accessibility to extension services could provide pathways to obtain appropriate information (such as improved agricultural technology) needed to scale up an agribusiness enterprise, thus, decreasing the probability of being poor.

Table 3. Determinant of youth poverty status, ESPR.

Variable	Selection	Poverty Status		Vulnerability to Poverty	
	Participation =1/0	Participation =1	Participation =0	Participation =1	Participation =0
Gender	0.159 (0.139)	−0.881 [a] (0.315)	−0.772 [a] (0.133)	−0.320 (0.280)	−4.970 [a] (0.820)
Age	0.039 (0.444)	−1.740 [c] (0.898)	−0.683 [c] (0.414)	−0.132 (0.953)	−17.18 [a] (2.735)
Education	0.190 [c] (0.097)	0.250 (0.192)	−0.040 (0.087)	−0.202 (0.199)	1.799 [a] (0.404)
Marital status	−0.095 (0.142)	−0.942 [c] (0.335)	−0.409 [a] (0.140)	−1.87 [a] (0.019)	0.405 (0.403)
Engage in non-agricultural work	0.190 (0.126)	0.183 (0.266)	0.476 [a] (0.132)	0.210 (0.200)	2.362 [a] (0.488)
Access to credit	0.340 [b] (0.134)	0.760 [b] (0.331)	0.220 (0.157)	0.432 (0.319)	4.708 [a] (0.713)
Access to extension	0.184 (0.146)	0.994 [c] (0.318)	−0.081 (0.148)	0.721 [a] (0.206)	−0.212 (0.459)
Productive asset	0.039 [a] (0.015)	0.112 [a] (0.042)	0.062 [a] (0.015)	−0.080 (0.113)	−0.022 (0.038)
Membership YO	1.070 [a] (0.121)				
Ogun state	0.132 (0.132)	1.002 (0.330)	0.357 [a] (0.133)	0.424 (0.319)	5.253 [a] (0.793)
Constant	−2.477 [a] (1.480)	5.929 [b] (2.961)	1.843 (1.382)	0.362 (0.259)	0.499 [a] (0.081)
ρ_1/Rh1		−0.528 [b] (0.243)		0.797 [a] (0.056)	
ρ_0/Rh0			−0.634 [a] (0.212)		0.201 (0.882)
Waldchi^2 (10)		122.68 [a]			
Log likelihood		−617.122			
Observation		668			

Source: Authors, 2021. [a], [b], [c] denote significance levels at 1%, 5%, and 10%, respectively. Standard errors are in parenthesis.

Engagement in non-farm work and productive assets also reduce the likelihood of being poor among non-participants. Youth who engage in non-agricultural work, such as petty trading, teaching, and transportation business, generate additional income from these activities. Thus, this set of young individuals has a proportional advantage over their counterparts. The appropriate utilization of valuable inputs/assets for production could enhance the efficiency and profitability of youth farmers, which invariably reduces their propensity for being poor.

Educational attainment, engagement in non-farm work, access to credit, and residence in Ogun decrease the future risk of being poor among non-participants of YIAP. The significance of education with respect to vulnerability to poverty suggests that the more educated the non-participant of YIAP, the less their risk of being poor in the future. A plausible explanation could be that educated youths might have more exceptional agribusiness skills (such as marketing and consultancy) than non-educated youths. On the contrary, gender and age significantly increase the non-participants' risk of future poverty. This finding supports that of Zereyesus et al. [31] with respect to agricultural households in Ghana. In contrast, Dey [28] and Ogundipe et al. [32] found gender and age to significantly decrease vulnerability to poverty of farm households in India and Nigeria, respectively. Participants of YIAP who are married have a propensity for being poor in the future, whereas those who have access to extension services are less vulnerable to poverty.

3.4. Impact of YIAP on Poverty and Vulnerability

Table 4 presents the average treatment effect of YIAP participants and non-participants according to the ESPR model.

Column two shows the results of the average treatment on the treated (ATT), which is the mean difference between participants of YIAP in their participation state and if they had

participated in the YIAP. In column 3, the average treatment effect on the untreated (ATU) is computed. This is the mean difference between non-participants in their non-participation state and if they had participated in YIAP.

The results from Table 4 show that participation in YIAP has a statistically significant impact on the poverty status of the youth. The positive and statistically significant effect of YIAP indicates that involvement in YIAP has the probability of decreasing the likelihood of being poor by about 37%. Subsequently, non-participants of YIAP would have been about 32% less poor or better-off had they participated in the program. The vulnerability impact estimates indicate that participation in YIAP has no significant impact on vulnerability to poverty. However, if non-participants of YIAP had participated in YIAP, the probability of being vulnerable to poverty would have been reduced by about 28%.

Table 4. Impact estimates of youth poverty and vulnerability to poverty, ESPR.

Outcome	Participants (ATT)		Non-Participants (ATU)	
	Estimate	Robust Standard Error	Estimate	Robust Standard Error
Poverty	0.368 [b]	0.143	0.320 [a]	0.034
Vulnerability	0.080	0.092	0.275 [a]	0.025

Source: Authors, 2022. [a] and [b] denote significance levels at 1% and 5%, respectively.

4. Conclusions

In this study, we examined the impacts of YIAP participation on poverty and vulnerability to poverty among youth in Nigeria based on an analysis of 668 sampled youths.

The endogenous switching probit regression model was used to control for estimation issues arising from both observed and unobserved heterogeneities in household characteristics.

The results reveal that the poverty headcount of the sample youths was approximately 60%, using the international poverty line of USD 1.9/day as the benchmark. Findings show that some socioeconomic and institutional variables significantly influence youth poverty status and vulnerability to poverty. The significant effect of gender on poverty and vulnerability to poverty suggests that female youths should be encouraged in agribusiness. Giving the same enrolment quota to both gender groups in agribusiness programs could enhance female participation in agribusiness and subsequently reduce poverty among them. Strengthening and implementing practical agribusiness programs in the Nigerian education system/curriculum is recommended. Going beyond theoretical learning, the inclusion of valuable agribusiness lessons for young individuals in secondary and polytechnics could enlighten and sharpen the skills of the youth. These skills could proffer financial opportunities and thus contribute to poverty reduction. The establishment of friendly and accessible credit facilities targeted at youth by government and private financial institutions is recommended.

Our empirical findings also reveal that youths that participated in YIAP had a significant gain from their participation, and non-participants would have been less poor and vulnerable to poverty had they participated in YIAP. This study affirms the poverty-reduction impact of YIAP; therefore, we recommend subsequent implementation of YIAP in different parts of the country. Our study is based on cross-sectional data limited to southwest Nigeria due to timeframe and security issues in other parts of the country at the time of the survey. We, therefore, recommend further research targeted at youth in other parts of the country.

Author Contributions: Conceptualization, L.O.B., L.J.S.B., G.D.-A. and B.A.A.; methodology, L.O.B. and G.D.-A.; software, L.O.B., L.J.S.B., T.A., V.M., Z.B. and B.A.A.; validation, L.O.B., L.J.S.B., G.D.-A., A.I.O., K.O., T.A., V.M., Z.B. and B.A.A.; formal analysis, L.O.B.; investigation, L.O.B., L.J.S.B., G.D.-A., A.I.O., K.O., T.A., V.M., Z.B. and B.A.A.; resources, L.O.B., L.J.S.B., T.A., V.M., Z.B. and B.A.A.; data curation, L.O.B. and B.A.A.; writing—original draft preparation L.O.B., L.J.S.B., G.D.-A. and B.A.A.; writing—review and editing, L.O.B., L.J.S.B., G.D.-A., A.I.O., K.O., T.A., V.M., Z.B. and B.A.A.; visualization, L.O.B., L.J.S.B., G.D.-A., A.I.O., K.O., T.A., V.M., Z.B. and B.A.A.;

supervision, L.J.S.B., G.D.-A. and B.A.A.; project administration, L.O.B., L.J.S.B., T.A., V.M., Z.B. and B.A.A.; funding acquisition, L.O.B. and Z.B. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by the International Fund for Agricultural Development (IFAD) under grant number 2000001374, and the APC was funded by the International Institute of Tropical Agriculture (IITA).

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and approved by the Institutional Review Board of the International Institute of Tropical Agriculture (IRB/IF-CA/001/2021) for studies involving humans.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the survey.

Data Availability Statement: The data presented in this study are available on request from the International Institute of Tropical Agriculture.

Acknowledgments: We appreciate the financial support granted for this study by the International Fund for Agricultural Development (IFAD) and the International Institute of Tropical Agriculture (IITA).

Conflicts of Interest: The authors declare no conflict of interest.

References

1. UNECA. *Addressing the Youth Education and Employment Nexus in the New Global Economy*; Africa Youth Report; United Nations Economic Commission for Africa: Addis Ababa, Ethiopia, 2011.
2. Allen, A.; Howard, J.; Kondo, M.; Jamison, A.; Jayne, T.; Snyder, J.; Tschirley, D.; Yeboah, K.F. *Agrifood Youth Employment and Engagement Study*; Michigan State University: East Lansing, MI, USA, 2016.
3. Ghebru, H.; Amare, M.; Mavrotas, G.; Ogunniyi, A. Role of land access in youth migration and youth employment decisions: Empirical evidence from rural Nigeria. *Int. Food Policy Res. Inst.* **2018**, *58*, 1–26.
4. Mueller, V.; Thurlow, J.; Rosenbach, G.; Masias, I. Africa's rural youth in the global Context. In *Youth and Jobs in Rural Africa*; Oxford University Press: Oxford, UK, 2019; pp. 1–22.
5. Olagunju, K.O.; Ogunniyi, A.; Oguntegbe, K.F.; Oyetunde-Usman, Z.A.; Adenuga, A.H.; Andam, K.S. The impact of quality foundational skills on youth employment in Africa: Does institutional quality matter? *Int. Food Policy Res. Inst.* **2020**, *1963*, 1–38.
6. Rufai, A.M.; Ogunniyi, A.I.; Salman, K.K.; Salawu, M.B.; Omotayo, A.O. Rural Transformation and Labor Market Outcomes among Rural Youths in Nigeria. *Sustainability* **2021**, *13*, 13794. [CrossRef]
7. Brooks, K.; Zorya, S.; Gautam, A.; Goyal, A. Agriculture as a Sector of Opportunity for Young People in Africa. *World Bank Policy Res. Work. Pap.* **2013**, *6473*, 1–41. Available online: http://econ.worldbank.org (accessed on 20 April 2022).
8. Elias, M.; Mudege, N.N.; Lopez, D.E.; Najjar, D.; Kandiwa, V.; Luis, J.S.; Bentaibi, A. Gendered aspirations and occupations among rural youth, in agriculture and beyond: A cross-regional perspective. *J. Gend. Agric. Food Secur.* **2018**, *3*, 82–107.
9. Haggblade, S.; Chapoto, A.; Drame-Yayé, A.; Hendriks, S.; Kabwe, S.; Minde, I.; Mugisha, J.; Terblanche, S. Motivating and preparing African youth for successful careers in agribusiness. *J. Agribus. Dev. Emerg. Econ.* **2015**, *5*, 170–189. [CrossRef]
10. NBS. Delta, 2nd Least Poor State in Nigeria. Nations Bureau of Statistic, Vanguard Newspaper. 2020. Available online: https://www.vanguardngr.com/2020/05/delta-2nd-least-poor-state-in-nigeria-nbs/ (accessed on 5 September 2021).
11. Bello, L.O.; Baiyegunhi, L.J.S.; Mignouna, D.; Adeoti, R.; Dontsop-Nguezet, P.M.; Abdoulaye, T.; Manyong, V.; Bamba, Z.; Awotide, B.A. Impact of Youth-in-Agribusiness Program on Employment Creation in Nigeria. *Sustainability* **2021**, *13*, 7801. [CrossRef]
12. Marcysiak, T.; Prus, P. Life strategies of rural inhabitants of unfixed economic function. In Proceedings of the 26th International Scientific Conference Agrarian Perspectives XXVI Competitiveness of European Agriculture and Food Sectors, Prague, Czech Republic, 13–15 September 2017; pp. 212–218.
13. Akande, T. *Youth Unemployment in Nigeria: A Situation Analysis*; Africa in Focus; The Brookings Institute: Washington, DC, USA, 2014.
14. Fawole, W.O.; Ozkan, B. Examining the willingness of youths to participate in agriculture to halt the rising rate of unemployment in South Western Nigeria. *J. Econ. Stud.* **2019**, *46*, 578–590. [CrossRef]
15. Lyocks, J.S.; Lyocks, S.W.J.; Kagbu, J.H. Mobilizing youth for participation in Nigerian Agricultural Transformation Agenda: A grassroots' approach. *J. Agric. Extension* **2013**, *17*, 78–87. [CrossRef]
16. Gangwar, R.; Kameswari, V. Attitude of rural youth towards agriculture as a means of livelihood. *J. Appl. Nat. Sci.* **2016**, *8*, 879–882. [CrossRef]
17. Tiraieyari, N.; Krauss, S.E. Predicting youth participation in urban agriculture in Malaysia: Insights from the theory of planned behavior and the functional approach to volunteer motivation. *Agric. Hum. Values* **2018**, *35*, 637–650. [CrossRef]
18. Muhammad-Lawal, A.; Omotesho, O.; Falola, A. Technical efficiency of youth participation in agriculture: A case study of the youth-in-agriculture programme in Ondo State, South-Western Nigeria. *Niger. J. Agric. Food Environ.* **2009**, *5*, 20–26.

19. Osabohien, R.; Wiredu, A.N.; Nguezet, P.M.D.; Mignouna, D.B.; Abdoulaye, T.; Manyong, V.; Awotide, B.A. Youth Participation in Agriculture and Poverty Reduction in Nigeria. *Sustainability* **2021**, *13*, 7795. [CrossRef]
20. Baiyegunhi, L.J.S.; Fraser, G.C.G. Vulnerability and poverty dynamics in rural areas of Eastern Cape Province, South Africa. *Ghana J. Dev. Stud.* **2011**, *8*, 84–100. [CrossRef]
21. Bless, C.; Higson-Smith, C.; Kagee, A. *Fundamentals of Social Research Methods: An African Perspective*; Juta and Company, Ltd.: Cape Town, South Africa, 2006.
22. Cochran, W.G. *Sampling Techniques*, 3rd ed.; John Willey and Sons: New York, NY, USA, 1977.
23. NBS. *Unemployment and Underemployment by State*; National Bureau of Statistics: Abuja, Nigeria, 2019.
24. Lokshin, M.; Sajaia, Z. Impact of interventions on discrete outcomes: Maximum likelihood estimation of the binary choice models with binary endogenous regressors. *Stata J.* **2011**, *11*, 368–385. [CrossRef]
25. Di Falco, S.; Veronesi, M.; Yesuf, M. Does adaptation to climate change provide food security? *A micro-perspective from Ethiopia. Am. J. Agric. Econ.* **2011**, *93*, 825–842.
26. Chaudhuri, S.; Jalan, J.; Suryahadi, A. *Assessing Household Vulnerability to Poverty from Cross-Sectional Data: A Methodology and Estimates from Indonesia*; Columbia University Department of Economics Paper Series, Discussion Paper: 0102-52; CORE: New York, NY, USA, 2002.
27. Amemiya, T. The Maximum Likelihood and the Nonlinear Three-Stage Least Squares Estimator in the General Nonlinear Simultaneous Equation Model. *Econometrica* **1977**, *45*, 955. [CrossRef]
28. Bello, L.O. *The Alcohol and Tobacco Use and Labour Market Nexus in South Africa; Working Paper 183; Southern Africa-Towards Incusive Economic Development (SA-TIED)*; UNU-WIDER: Finland, Sweden, 2021.
29. Ogunniyi, A.; Oluseyi, O.K.; Adeyemi, O.; Kabir, S.K.; Philips, F. Scaling up agricultural innovation for inclusive livelihood and productivity outcomes in sub-Saharan Africa: The case of Nigeria. *Afr. Dev. Rev.* **2017**, *29*, 121–134. [CrossRef]
30. Zereyesus, Y.A.; Embaye, W.T.; Tsiboe, F.; Amanor-Boadu, V. Implications of non-farm work to vulnerability to food poverty-recent evidence from Northern Ghana. *World Dev.* **2017**, *91*, 113–124. [CrossRef]
31. Dey, S. The Role o 539 f Employment Diversification in Reducing Vulnerability to Poverty among Marginal and Small-holder Agricultural Households in India. *Margin* **2018**, *12*, 88–112. [CrossRef]
32. Ogundipe, A.A.; Ogunniyi, A.; Olagunju, K.; Asaleye, A.J. Poverty and income inequality in rural Agrarian household of southwestern Nigeria: The gender perspective. *Open Agric. J.* **2019**, *13*, 51–57. [CrossRef]