



Research article

Can young agripreneurs improve their skills through agripreneurship empowerment programmes? Evidence from Africa



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ABSTRACT

This article examined the driving forces behind young agripreneurs' participation in agripreneurship empowerment programmes and estimates the causal impact of programme participation on agripreneurship skills using data from a random cross-section sample of 1435 young agripreneurs in Kenya, Nigeria, and Uganda. Specifically, the study took evidence from the youth component of the African Development Bank Technologies for African Agricultural Transformation (TAAT) programme, Empowering Novel Agribusiness-Led Employment (ENABLE). An endogenous switching model was used to identify factors that significantly informed participation decisions and assess the programme's impact on youth agripreneurship skills. Age, education, agripreneurship experience, business level, current residence, and training perception significantly influenced participation. Even though both programme participants and non-participants had high agripreneurship skills scores, participants had higher scores across the three countries than non-participants. The causal impact estimation from the switching regression model also indicates that participation has a positive and significant impact on agripreneurship skills, which implies that the higher score achieved by participants could be attributed to their involvement in the ENABLE-TAAT programme. These results suggest raising awareness of youth agribusiness empowerment programmes and encouraging youth to participate more actively. Additionally, the result suggests the need to implement strategies that could change young people's negative perception of agricultural interventions for increased participation.

1. Introduction

In recent years, more emphasis has been placed on young graduates who, despite their literacy level, struggle to find gainful employment in the labour market. According to reports, graduate youth unemployment is pronounced and severe in Africa [1], due to limited opportunities for self-development and employment, particularly in the formal sector [2]. For instance, tertiary institutions in Nigeria and Kenya graduate an average of 500,000 students annually, but only about half can secure sustainable employment [3]. The

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situation is worse in Uganda, where nearly 400,000 young graduates compete for only about 9000 available jobs each year. This corroborates Ntale et al. [4], who noted that over 30% of Ugandan youths who are institutionally qualified are unable to find employment. The situation is more difficult for semi-skilled and unskilled youths. This low labour market absorption rate has left about one-third of the closely 420 million youth in the continent discouraged and unemployed, another third in vulnerable employment, and only one in six in wage employment [5]. Unarguably, unemployment and underemployment threaten the welfare of youth and, more generally, the stability and socio-economic development of their society [6]. According to the World Bank [7], over 40% of youths who join rebel groups do so for lack of employment and other income-generating opportunities.

These ongoings have led to a growing demand for urgent policy- and programme-level interventions to curb youth unemployment, underemployment, and its accordant undesirable outcomes, particularly among young graduates. In response, African leaders and development partners have made concerted efforts, primarily focused on promoting a shift from conventional formal employment towards entrepreneurship, with a deliberate focus on agriculture. Such measures include the youth component of the African Development Bank Technologies for African Agricultural Transformation (TAAT) programme called Empowering Novel Agribusiness-Led Employment (ENABLE), designed and implemented to reduce the economic marginalization of African youth by introducing them to modern agricultural technologies to promote agribusiness development. Furthermore, the programme aimed to help young people develop relevant agribusiness skills and capabilities in various aspects of the agricultural value chain for improved agribusiness performance and, subsequently, better livelihood outcomes. The central vision is of youth as agribusiness operators operating across different agricultural value chains to enjoy the livelihood and financial benefits embedded in commercialisation within the framework of globalisation [8].

While the importance of youth agribusiness in reducing youth unemployment [9,10], combating hunger and food insecurity and revamping the agricultural sector has been widely discussed in Literature [11,12], Babu et al. [13] argued that its development, particularly in Africa is accompanied by many bottlenecks including low skill set required for agribusiness and related activities. According to the authors, young people typically have limited knowledge and agribusiness skills and little or no exposure to the agribusiness environment. As a result, they face severe market and price risks compounded by the risky and uncertain nature of agricultural activities. This is supported by other scholars, who noted that while all age groups face recurring challenges associated with agribusiness, such as access to technology, weather uncertainty, poor market linkages, and price risks, these challenges are typically exacerbated for young people due to lack of relevant agribusiness skills and experience [14,15].

According to Lachaud et al. [16], lack of skills undermines efficiency and deters agricultural growth and development. This corroborates Akinbami et al. [17], who attribute poor enterprise development to the lack of relevant skill sets and productive assets, which invariably leads to business failure. Ouko et al. [10] opined that despite several opportunities in agribusiness, young people might not benefit from these opportunities due to poor or lack of relevant agribusiness skills. This is supported by Adeyanju et al. [18], who posits that the resource constraints that young agribusiness operators face necessitate the development of relevant agribusiness skills needed to maximize their limited resources and profit. With ongoing economic and environmental challenges facing the World, there is a more urgent need to diversify young farmers' skills beyond primary food production in order to expand their economic opportunities and improve their livelihood [19].

In recent times, agribusiness empowerment programmes have become a common strategy to promote youth agribusiness, help young people develop relevant skills, and invariably improve the performance of youth-led agribusiness enterprises [18,20,21]. Many studies have described these programmes as a push factor for young people to adopt innovations designed to solve specific agricultural problems [12], and some have reported their potential in harnessing the agribusiness potential and improving the agribusiness skills of young farmers [18]. However, while the rapid evolution of agribusiness empowerment programmes is well understood and documented, not much is known about how they contribute to their beneficiaries' agribusiness skills development and business performance. This is consistent with the argument of Ray et al. [12] that intervention aimed at shaping young people as the future of agriculture receives little empirical attention. This lack of empirical evidence, in turn, poses a challenge in making evidence-based policies on youth agribusiness, developing policy strategies for successful investments in youth, and properly positioning the continent for the long-advocated agricultural transformation.

It is worth noting that the bulk of existing studies on agribusiness empowerment and agricultural programmes target small-holders without necessarily focusing on young actors [22–25]. Also, the few studies focused on youth are country-specific, and a comparativeness of what works in different countries coupled with the determining factors related to programme participation and agribusiness skills are lacking [9]. Thus, from an economic and cultural perspective, it is cognitively beneficial to have a reference point in data from different countries to obtain adequate and in-depth judgments on programme impacts and compare outcomes between countries.

This study addresses the identified research gaps by assessing the impact of the ENABLE-TAAT youth programme of the African Development Bank on youth agribusiness skills while recommending a feasible direction for properly positioning agribusiness to yield better economic outcomes for youths. Concerning sample size and comparativeness, the study took samples from three African countries to assess the programme's impact on youth agribusiness skills.

2. Review of literature

2.1. Entrepreneurship skills required by farmers

Beyond food production, an entrepreneurial farmer is a businessman concerned with profit maximization and business expansion [26]. Generally, the skills required by farmers to improve their competitiveness and productivity include relationship building,

strategic planning, identification of market opportunities, and marketing [26].

Based on an extensive review of Literature, De Wolf et al. [27] classified these skills into five categories, as presented in [Appendix A](#). According to the authors, professional skills are paramount to the success and survival of any agribusiness since no business can succeed without basic production and technical skills. Management skills are required to deal with the growing complexity related to agribusiness. Opportunity, Cooperation/Networking, and Strategic Skills are necessary to identify and pursue business opportunities, strategize to develop profitable agribusiness ventures, and establish and improve agribusinesses.

Beyond farm management, Opolot et al. [26] highlighted the relevance of these skills and competencies in strengthening farmers' abilities and attitudes towards agripreneurship. According to the authors, entrepreneurial skills and competencies are essential to increase farmers' productivity and access to markets for sustainable agricultural development, improved food security, and increased income. In agreement, Hennon [28] argued that entrepreneurial skills such as creativity and risk-taking change farmers' orientation towards adopting new management practices and improved technologies, contributing to their productivity.

Apata [29] linked entrepreneurship skills to better productivity and income which are indicators of better farm-level performance, while other authors have found that entrepreneurship skills help farmers to explore new enterprise growth pathways and demonstrate higher capacity in opportunity recognition and business growth [30,31].

2.2. Skill acquisition through entrepreneurship programmes

The argument that entrepreneurs are born has been countered by many scholars who believe that entrepreneurial skills for viable business creation can be instilled in individuals through formal and non-formal education, including business incubation based on practical approaches [32,33]. This argument is strengthened by Valerio et al. [34], who posited that beyond innate abilities, entrepreneurial skills could be learned via active experimentation.

Even though entrepreneurship programmes are described as a collection of processes designed to equip people with the necessary skills needed for entrepreneurial activities, there is mixed evidence on the extent to which such programmes aid skills acquisition. In his study on 'Reducing Recidivism Through Entrepreneurship Programmes,' Cooney [35] argued that, to some extent, entrepreneurship skills depend on specific personal characteristics and may be challenging to stimulate within a group or structured programme. Similarly, Henry et al. [36] criticised entrepreneurship programmes for focusing excessively on the functional aspects of enterprise management rather than contributing to the development of entrepreneurs' broader capacity for innovation and business management, as well as for developing and promoting their enterprises. Generally, these authors recognized the benefits of entrepreneurship programmes in providing participants insights into the areas where they lack expertise or knowledge. However, their argument follows that programme may not necessarily lead to skill acquisition and development.

Despite this ongoing criticism of entrepreneurship programmes for their generic nature, a few studies have established their relevance to skill acquisition in developing countries. For instance, Opolot et al. [26] assessed the influence of university entrepreneurship programmes on farmers' competencies for improved productivity and market access in Uganda. A positive relationship was found between training and farmers' entrepreneurship skills (record-keeping ability, marketing, and value addition), including agricultural production and technical skills. Similarly, Saripah et al. [37] reported the significance of the 'Entrepreneurship Skill Education Program in Indonesia in empowering rural communities through better entrepreneurial knowledge, skills and attitudes. This also corroborates Drexler et al. [38] and Giné and Mansuri [39], whose studies established a positive relationship between entrepreneurship programmes and business skills. Stevenson and St-Onge [40] concluded that entrepreneurship programmes allow producers in growth industries, such as agriculture, to access the value chain related to their products. These studies differ from the current study, as they are not sector-specific, generalized entrepreneurship programmes and focus on different categories of the population whose socioeconomics are quite different from youths.

There are relatively few reports on agripreneurship programmes. In their study on "Training for Rural Development: Agricultural and Enterprise Skills for Women Smallholders," Collett and Gale [41] reported that enterprise training could improve risk-bearing capacity and farmers' management and market skills. The sole focus of their study on women farmers differentiates it from the current study.

While many studies on entrepreneurship programmes show, minimal and statistically insignificant impacts [38,42], very few have found positive and significant effects [43,44]. However, few have focused on agripreneurship empowerment programmes for youths and agripreneurship skills using empirical models. This study addresses these gaps, using an empirical model to assess the impact of agripreneurship empowerment programmes on youth agripreneurship skills.

3. Materials and methods

3.1. Study area and data collection

Data utilized in this study were collected from young agripreneurs affiliated with the ENABLE-TAAT programme in Kenya, Nigeria, and Uganda. The programme was funded by the African Development Bank (AfDB) and led by the International Institute of Tropical Agriculture (IITA) to contribute to job creation, food and nutrition security, income generation and improved livelihoods of African youths. Specifically, the Programme aims to create decent employment opportunities for young men and women along priority agricultural value chains through improved access to technical and business skills for agripreneurship.

The survey was conducted between August and December 2021. Quantitative data were collected on important variables, including demographic information, agripreneurship training, and entrepreneurial skills related to agriculture. Data was also collected on socio-

economic characteristics such as age, gender, education, and marital status.

To achieve randomization, a multistage stratified random sampling technique was adopted in selecting the respondents. In the first stage, the three countries previously mentioned were purposively selected based on important criteria set by the research team. Firstly, they were three of the pioneering countries in which the ENABLE-TAAT programme was conducted in 2018. The second criterion was related to the severity of unemployment and underemployment, while the third criterion was based on the relatively high number of programme participants compared to the other countries. In the second stage, the study population was stratified into two groups; participants and non-participants, the participants being those who participated in the ENABLE-TAAT programme and the non-participants being other young agripreneurs who did not participate in the programme. The list of participants and non-participants, which served as the sampling frames, was obtained from the programme coordinating office in each country. The third stage involves randomly selecting youths from the two sampling frames to make a sample size of 1463, which was determined based on the method proposed by Tepping [45]. This sample size was proportionately shared among the three countries based on the number of participants and non-participants in each country. The random selection of the participants and non-participants was done via random numbers generated using Microsoft Excel. A total of 1435 young agripreneurs who gave their full consent participated in the survey across the three countries. Out of this, responses were obtained from 400, 429, and 606 respondents in Kenya, Nigeria, and Uganda, respectively. This represents a 98% response rate which is sufficient for the analysis.

3.2. Assessing the impact of the programme on youth agripreneurship skills

Many scholars have argued that assessing the impact of an intervention based on non-experimental observations could be a bit challenging. This is attributed to the issue of counterfactuals, whose outcome is not observed. One proposed solution to this challenge is finding suitable instruments to account for endogeneity. However, another challenge is associated with the standard econometric method of using a pooled sample. The basic assumption of a pooled regression model is that the two groups have common slope coefficients. In other words, it is assumed that the set of covariates included in the model has the same influence on both programme participants and non-participants. The application of a pooled regression would, therefore, imply that the participation status of youth (participants or non-participants) only has a parallel shift (intercept) effect on agripreneurship skills, which means that the intercept shift effect will be the same regardless of the values of other parameters included in the Equation. In addition, youth may endogenously self-select participation in the programme, which implies that participation decisions may be systematically influenced by both observed and unobserved characteristics associated with outcomes. This type of econometric problem (endogeneity and sample selection bias) motivates the choice of the Endogenous Switching Regression (ESR) model to assess the programme’s impact on youth entrepreneurship skills.

The ESR model can be estimated using different approaches. For instance, Lokshin and Sajaia [46] highlighted using two-step least square or maximum likelihood estimation. However, these estimation methods have been criticized for being inefficient in deriving consistent standard errors [47]. Thus, to tackle this econometrics drawback, this study estimated the ESR model using the Full Information Maximum Likelihood (FIML) approach.

3.2.1. Model specification

The ESR model follows a two-step estimation procedure whose first stage estimates a binary model that models selectivity. The selection/treatment equation is specified in Equation (1);

$$A_i^* = K_i \alpha + \epsilon_i \tag{1}$$

where;

A_i is a binary variable that equals 1 if a youth participated in the programme and 0 otherwise; α is the vector parameter to be estimated; K_i represents other covariates determining participation, such as the youth demographic characteristics (such as age, gender, education, marital status, household size, and type of employment), ownership of assets (such as personal and agribusiness); ϵ_i is the error term

The binary model used in the first stage distinguishes programme participants from non-participants. Based on this, participation decision was measured as a dichotomous variable that equals 1 if a respondent participated and 0 otherwise. From Equation (1), the reduced form of the participation equation can be specified as expressed in Equation (2)

$$A_i = \begin{cases} 1 & \text{if } A_i^* > 0 \\ 0 & \text{otherwise} \end{cases} \tag{2}$$

The Average Treatment Effect (ATE) of a linear regression that contains the endogenous binary-selection variable is estimated in the second stage. The outcome equations (in this case, agripreneurship skills) corrected for endogenous participation for participants (regime 1) and non-participants (regime 2) are given as Equations (3a) and (3b):

$$\text{Regime 1 : } Y_{1i} = \beta_1 X_{1i} + \sigma_{1\epsilon} \hat{\lambda}_{1i} + \eta_{1i} \text{ if } A_i = 1 \text{ (Participants)} \tag{3a}$$

$$\text{Regime 2 : } Y_{2i} = \beta_2 X_{2i} + \sigma_{2\epsilon} \hat{\lambda}_{2i} + \eta_{2i} \text{ if } A_i = 0 \text{ (non - Participants)} \tag{3b}$$

Where Y_i is the outcome variable, X_i represents the vector of explanatory variables, β and σ are the parameters to be estimated, $\hat{\lambda} \hat{\lambda}_1 =$

$\frac{\varphi(K_i \hat{\alpha})}{\varphi(K_i \hat{\alpha})}$ and $\hat{\lambda}_2 = \frac{\varphi(K_i \hat{\alpha})}{1 - \varphi(K_i \hat{\alpha})}$ is the Inverse Mill Ratio (IMR) computed from the selection equation to correct selection bias, η is the error term, and i represent each respondents surveyed. η_{1i} and η_{2i} are assumed to have a tri-variate normal distribution with zero mean and covariance matrix, Σ :

$$\Sigma = \begin{bmatrix} \sigma_{\epsilon}^2 & \cdot & \cdot \\ \sigma_{\eta_1 \epsilon} & \sigma_{\eta_1}^2 & \cdot \\ \sigma_{\eta_2 \epsilon} & \cdot & \sigma_{\eta_2}^2 \end{bmatrix}$$

Where σ_{ϵ}^2 is the variance of the error term in the assignment equation, $\sigma_{\eta_1}^2$ and $\sigma_{\eta_2}^2$ are variances of the error terms in the outcome equations, $\sigma_{\eta_1 \epsilon}$ and $\sigma_{\eta_2 \epsilon}$ are covariance of ϵ_i , η_{1i} and η_{2i} respectively. According to Mojo et al. [48], the covariance of the corresponding error terms is not defined since Y_{1i} and Y_{2i} are not observed simultaneously. This shows a correlation between the error terms of the outcome equation (η_{1i} and η_{2i}) and that of the selection equation (ϵ_i). Thus, the expected values of the truncated error terms ($\eta_1 | A = 1$) and $E(\eta_2 | A = 0)$ can be defined as Equations (4) and (5):

$$(\eta_1 | A = 1) = E(\eta_1 | \epsilon > -K\alpha) = \sigma_{\eta_1 \epsilon} \frac{\varphi(K_i \hat{\alpha})}{\varphi(K_i \hat{\alpha})} \equiv \sigma_{\eta_1 \epsilon} \hat{\lambda}_1 \tag{4}$$

$$(\eta_2 | A = 1) = E(\eta_2 | \epsilon > -K\alpha) = \sigma_{\eta_2 \epsilon} \frac{-\varphi(K_i \hat{\alpha})}{1 - \varphi(K_i \hat{\alpha})} \equiv \sigma_{\eta_2 \epsilon} \hat{\lambda}_2 \tag{5}$$

Φ and φ , respectively, are the cumulative distribution function and probability density of the standard normal distribution. The inverse Mills ratio $\hat{\lambda}_1$ and $\hat{\lambda}_2$ (selectivity terms) is defined as the ratio of Φ and φ , evaluated at $K\alpha$. A significant non-zero value of the covariance $\sigma_{\eta_1 \epsilon}$ and $\sigma_{\eta_2 \epsilon}$ implies that the selection and the outcome variables are correlated [48] and, therefore, validates the use of the ESR model.

The essence of including the IMR derived in stage 1 as an independent variable in stage 2 is to correct for endogeneity arising from the participation decision. According to Aakvik et al. [49], estimating the outcome variables without correcting for this possible endogeneity could result in biased outcome estimates. Thus, it is important to impose a justifiable exclusive restriction on the stage 2 equation [50]. However, the instrument to include in the selection equation is expected to influence participation decisions and not the outcome variable.

The selection equation's dependent variable is participation, which indicates whether or not a youth participated in the programme. The dependent variables of the outcome equation are agripreneurship skills, quantified using a composite index. The explanatory variables constitute socioeconomic and demographic factors selected based on past studies [10,11].

The Average Treatment effect on the Untreated and Treated (ATU and ATT) was computed using the expected values of the dependent variable for participants and non-participants in counterfactual and actual scenarios as specified in Equations (6)–(9):

$$E(Y_{1i} | A_i = 1, X_{1i}) = \beta_1 X_{1i} + \sigma_{\eta_1 \epsilon} \rho_1 \frac{\varphi(K_i \hat{\alpha})}{\varphi(K_i \hat{\alpha})} \tag{6}$$

$$E(Y_{2i} | A_i = 0, X_{2i}) = \beta_1 X_{2i} - \sigma_{\eta_2 \epsilon} \rho_1 \frac{\varphi(K_i \hat{\alpha})}{(1 - \varphi(K_i \hat{\alpha}))} \tag{7}$$

$$E(Y_{2i} | A_i = 1, X_{1i}) = \beta_2 X_{1i} + \sigma_{\eta_2 \epsilon} \rho_2 \frac{\varphi(K_i \hat{\alpha})}{\varphi(K_i \hat{\alpha})} \tag{8}$$

$$E(Y_{1i} | A_i = 0, X_{2i}) = \beta_2 X_{2i} - \sigma_{\eta_1 \epsilon} \rho_2 \frac{\varphi(K_i \hat{\alpha})}{(1 - \varphi(K_i \hat{\alpha}))} \tag{9}$$

Where ρ_1 and ρ_2 are correlation coefficients between the error terms of the selection equation, ϵ_i and outcome equations η_1 and η_2 .

The ATT is calculated as the difference between Equations (6) and (8) as specified in Equation (10):

$$ATT = E(Y_{1i} | A_i = 1, X_{1i}) - E(Y_{2i} | A_i = 1, X_{1i}) \tag{10}$$

The ATU is calculated as the difference between Equations (7) and (9) as specified in Equation (11):

$$ATU = E(Y_{1i} | A_i = 0, X_{2i}) - E(Y_{2i} | A_i = 0, X_{2i}) \tag{11}$$

3.2.2. Measure of agripreneurship skills

This study adopted the six agripreneurship skill constructs applied by Mukembo and Edward [51] to develop a composite index used to measure youth agripreneurship skills. The six constructs are modified to include (a) technical skills in terms of crop and animal production, (b) risk-taking propensity and endurance, (c) Innovativeness and ability to recognize opportunities, (d) leadership and ability to manage an agricultural venture (e) communication and marketing, and (f) control over resources and agricultural ventures, captures all the five categories described by De Wolf et al. [27] and those discussed by Elmuti et al. [52]. Based on this, twenty-seven

items were assessed on five response categories, including 5 (Strongly Agree), 4 (Agree), 3 (Neutral/Undecided), 2 (Disagree), and 1 (Strongly disagree) and a composite agripreneurship skills index was developed. Following Ray et al. [12], the agripreneurship skill index was generated using Equation (12). The index score, which ranges from 1 to 5 was categorized as follows; 1–2 (low), 3 (medium), and 4–5 (high). The questions asked are presented in AppendixB.

$$ASI = \frac{TSA}{Total\ items} \quad (12)$$

where ASI = Agripreneurship Skill Index and TSA = Total score by an Agripreneur based on individual ranking.

4. Results and discussion

4.1. Descriptive statistics

Table 1 presents the summary of the variables included in the ESR model. The results showed that the average age of the respondents was 29 years. The majority (57%) of respondents are male, with an average of 14 years of formal education. This denotes high engagement of females in agripreneurship and implies that the majority have at least tertiary education based on the education system categorization¹ used. 74% of respondents reside in rural areas, about 72% are from farming households and have an average of 2 agripreneurs within their households. The majority are fully engaged in agripreneurship with about 3 years of agripreneurship experience. Most of the respondents (72%) operate at the start-up level. Nearly half of the respondents had access to agripreneurship training opportunities. On their perception of such programmes, a more significant proportion (75%) perceive the programmes as beneficial in shaping the agripreneurship career of young people.

4.2. Agripreneurship skill index scores by country

Table 2 presents the agripreneurship skill index results calculated based on the 27 items assessed. The index ranges between 1 and 5 points, where scores below 3 points are classified as low, 3 points as medium, and above 3 as high. On average, participants and non-participants had a score of 4.45 and 4.07, respectively, indicating that both groups are highly skilled. This could be because the respondents are all young graduates between 18 and 35 years old. People in this age category are considered to be innovative and adventurous. However, despite being in the same age category and having relatively high levels of education, participants had a higher significant score at $p < 0.01$, which could have resulted from their participation in the ENABLE-TAAT programme. Similar results were obtained across the three countries, where participants had higher scores than non-participants.

4.3. Results of the ESR model

Table 3 presents the estimation results for the ESR model. The perception of agripreneurship programmes was imposed as an exclusive restriction to identify the model. The negative signs and significance of the covariance terms (ρ_1 and ρ_2) indicate the existence of self-selection in the decision to participate in the ENABLE-TAAT programme, implying that the participation decision was negatively correlated with the outcome variable (agripreneurship skill index score). This means that training may not have the same effect on non-participants even if they had participated in the programme [47]. Also, the significance ($p < 0.01$) of the likelihood ratio test indicates the existence of mutual dependence between the treatment and outcome equations of participants and non-participants. Based on these results, the null hypothesis of no correlation between the assignment (participation) and outcome (agripreneurship skill) equations was rejected, justifying the use of the ESR model.

4.3.1. Determinants of youth participation in agripreneurship empowerment programmes

The estimates for the determinants of youth participation in agripreneurship empowerment programmes are presented in the second column of Table 3. The findings show that the perception of agripreneurship empowerment programmes, as the exclusive restriction imposed on the selection equation, had a positive and statistically significant (at $p < 0.01$) effect on participation. This implies that those who perceive training as beneficial and a means of skill acquisition are more likely to participate in the programme than those with negative perceptions. According to Sinclair et al. [53], perceptions, developed through observations and experience, shape the adoption and sustainability of interventions. This corroborates Mengistu and Assefa [54], who argued that the participation and adoption process starts with a perception that there is a need for improvement or innovation. In essence, participation decision is shaped by the perceived utility an individual expects to gain from an intervention or programme. This aligns with Adeyanju et al. [18] and Magagula and Tsvakirai [9], who linked positive perceptions of agricultural programmes to increased participation in agricultural-related activities in Nigeria and South Africa, respectively. The level of education was positive and significant at $p < 0.01$, implying that more educated youths are more likely to participate in the programme. Accordingly, more educated people are drawn to innovative programmes such as the case study [55]. This finding also points to the significant role of formal education in connecting young people to empowerment programs that can improve their livelihood and economic status. However, this contradicts Adeyanju

¹ Primary education (6 years), Secondary education (12 years), and tertiary education (14 years and above).

Table 1
Descriptive statistics for the socio-economic and demographic characteristics.

Variable	Pooled	Kenya	Nigeria	Uganda
	n = 1435	n = 400	n = 429	N = 606
Age of Respondents (years)	28.50	29.04	29.59	27.38
Gender (male, %)	57.00	56.00	67.00	52.00
Education (years)	14.21	13.74	15.61	13.52
Agripreneurship Experience (years)	3.41	3.06	3.16	3.82
Residence (Rural, %)	74.00	94.00	33.00	89.00
Part-time engagements (%)	22.00	22.00	24.00	21.00
Access to training (%)	51.00	46.00	54.00	53.00
Sector of household head (%)	72.00	63.00	67.00	82.00
Number of Household agripreneurs (#)	2.24	2.06	1.97	2.54
Residence (Rural)	0.74	0.94	0.33	0.90
Business level (start-up, %)	72.00	76.00	76.00	67.00
Perception (%)	75.00	65.00	80.00	77.00

Source: Survey data (2021)

Table 2
Comparison of respondents' agripreneurship skill index scores by country.

Country	Participants	Non-participants	Difference
Pooled sample (n = 1435)	4.45	4.07	0.38 ^a
Kenya (n = 400)	4.26	4.02	0.24 ^a
Nigeria (n = 429)	4.56	4.17	0.39 ^a
Uganda (n = 606)	4.48	4.03	0.45 ^a

^a p < 0.01, **p < 0.05, *p < 0.1.

Source: Field survey (2021)

Table 3
Results of the ESR model.

Variables	Participation in training			Agripreneurship skills index			
	Pooled n = 1435			Participants n = 737		Non-participants n = 698	
	Coef.	M.E.	S.E.	Coef.	S.E.	Coef.	S.E.
(Log)Age	-1.099***	-0.437***	0.230	0.095	0.098	0.106	0.146
Gender	-0.073	-0.029	0.070	0.019*	0.462	0.097**	0.045
Level of Education (1 ⁰)	0.203***	0.084***	0.060	-0.080***	0.022	-0.048	0.042
Sector of Household head	0.053	0.024	0.079	0.121***	0.029	0.038	0.052
Agripreneurship experience	-0.057***	-0.023***	0.020	0.008	0.008	-0.007	0.012
Part-time engagement	-0.059	-0.025	0.083	0.015	0.030	0.089*	0.052
Access to training	-0.046	-0.019	0.080	0.095***	0.028	0.068	0.052
No of HH Agripreneurs	-0.053**	-0.019**	0.025	-0.003	0.010	0.045***	0.015
Business level	0.182**	0.070**	0.078	-0.086***	0.029	0.048	0.051
Current residence	0.183***	0.074***	0.062	0.075***	0.021	0.177***	0.046
Perception of training	0.522***	0.167***	0.078				
Constant	2.638***		0.736	4.289***	0.289	3.163***	0.480
ρ1, ρ2				-0.339**	0.159	-0.402***	0.088
Chi 2(1)	13.98***						

S.E. is Standard Error; M.E. is marginal effect, ***p < 0.01, **p < 0.05, *p < 0.1.

Source: Field survey (2021)

et al. [20] who argued that highly educated youths are often in continuous search for formal employment and therefore, share productive time between job search and other activities, likely to deprive them of the benefits embedded in agripreneurship empowerment programmes.

The significance and negative sign of agripreneurship experience denotes that more experienced youth may choose not to participate in the programme. This could be because more experienced youths, to some extent, may have some level of knowledge and technical skills required to run their businesses successfully. Hence, they may not see the need to participate in empowerment programmes. Furthermore, there may be a general misconception that such programmes are intended for beginners and start-ups. Such notions, however, should be discouraged, considering that agripreneurship is emerging and better practices are constantly being explored. As a result, those with such beliefs risk missing out on innovative methods that could improve agripreneurship skills and performance. Another reason could be the pattern of agricultural programs in many developing countries, which take a one-size-fits-all approach [20].

Similarly, the results show that those with more agripreneurs in their households are less likely to participate in the programme. Even though this is surprising since information flows better among household members engaged in similar activities, it could be because they depend on household agripreneurs for mentorship. Consistent with prior expectations, business level was positive and significant at $p < 0.01$. This suggests respondents at the start-up level are more likely to participate in empowerment programmes than those at growth or maturity levels. This could be attributed to the quest of start-ups to acquire more knowledge and skills based on the challenges associated with starting and running agribusinesses. It could also be attributed to the increased awareness that agricultural programmes could provide technical support, which could help overcome critical business challenges.

4.3.2. Factors influencing youth agripreneurship skills

Table 3 also presents the major factors that significantly influenced youth agripreneurship skills. This discussion focuses on the participants' significant results ($p < 0.01$). Even though education is perceived to facilitate better performance, the conversing effect of formal education on participation and agripreneurship skills shows that higher levels of education may encourage participation but may not contribute to better agripreneurship skills. This implies that agripreneurship skills do not depend on formal education. This result, however, calls for further investigation.

The positive and significant relationship between the sector where the household head is employed and agripreneurship skills implies that having a household head engaged in agriculture could help to improve agripreneurship skills. This could be attributed to the informal training and experience gained via working with household heads, as seen in many farming households in Africa where children/household members work as paid/unpaid farm labour.

The positive and significant relationship between access to training and agripreneurship skills is expected. This is because most agricultural training focuses on helping participants develop relevant skills for personal and agribusiness development. Thus, those with access to such training could have acquired relevant agripreneurship skills through participation, hence their higher skill index. This corroborates Ray et al. [12], who found that more agripreneurship training exposure enhances the ability of young farmers through capacity building.

The results also show that business level negatively and significantly (at $p < 0.01$) influenced agripreneurship skill level. As shown in the table, operating at the start-up level, which also denotes lesser years of agripreneurship experience, reduced agripreneurship skills score by 9% points. Generally, young agripreneurs could gain more expertise and abilities with growing years of agripreneurship experience [12]. Thus, since start-ups have relatively lesser years of experience, they may lack the necessary skills compared to those operating at growth and maturity stages. The location variable had a positive and significant influence on agripreneurship skills. The positive direction implies that residency in rural areas yields higher scores for participants. This could be because the bulk of agricultural programmes target rural residents since agriculture is the mainstay of the rural populace. This could have exposed them to more skill acquisition programmes than urban dwellers.

4.3.3. Impact of agripreneurship empowerment programme on agripreneurship skills

Table 4 presents the average treatment effect on the treated (ATT) and untreated (ATU), which shows the ENABLE-TAAT programmes' impact on youth agripreneurship skills. The results reveal that programme participation significantly improved participants' skills and could potentially improve that of non-participants. Specifically, the programme's causal effect, as shown by the ATT, is 0.73, representing a 20-percentage point² increase in the score of participants compared to that of non-participants. In real terms, participants had better agripreneurship skills by almost 1-indexed point than the non-participants.

The potential causal effect of programme participation for non-participants is 0.56, representing a possible 14% point increase in non-participants' scores if they had participated in the programme. Similar results were obtained across the three countries, where participants had a significant ATT and ATU, revealing that participation improved skills and could potentially improve the skills of non-participants if they had participated in the programme. These findings are consistent with the view that agripreneurship can generate better economic outcomes for young people [2,3,5] since better skills will contribute to better agripreneurship performance. These results corroborate Ouko et al. [10], who posit that effective capacity-building programmes can help young agripreneurs acquire the relevant skills needed to run and scale their businesses. Given there is an urgent need for hands-on-empowerment programmes that prioritize rural youth and young agripreneurs for better skills and business performance.

5. Conclusions and policy recommendations

The rapid expansion of agripreneurship empowerment programmes necessitates a rigorous impact assessment of existing programmes to ascertain their relevance and generate practical evidence to improve policy trajectories. This will also provide relevant stakeholders with proper insights into designing and implementing more effective policies and programmes for youth. This study assessed the impact of agripreneurship empowerment interventions on youth agripreneurship skills, taking evidence from the ENABLE-TAAT programme implemented in Kenya, Nigeria, and Uganda. The programme follows an experimental learning approach based on IITA's Agripreneur training (incubation) model, which focuses on agribusiness establishment and management. The findings of this study are relevant for making practical policy on youth agripreneurship in Africa.

The high level of agripreneurship skills among the respondents could have significant implications for the agricultural sector.

² Percentage points are calculated as the difference between the actual score of participants and non-participants divided by the score of participants/non-participants as it applies.

Table 4
Treatment effects.

Country	Outcomes	Predictions		Treatment Effect
	Agripreneurship Skill index	Entrepreneurs	Non-entrepreneurs	
Pooled	ATT	4.45	3.72	0.73***
	ATU	4.63	4.07	0.56***
Kenya	ATT	4.41	3.64	0.77***
	ATU	4.60	4.00	0.59***
Nigeria	ATT	4.51	3.85	0.67***
	ATU	4.68	4.19	0.50***
Uganda	ATT	4.43	3.68	0.74***
	ATU	4.61	4.03	0.58***

Notes: *** denotes statistical significance at a 1% level of significance.

Firstly, more skilled youths could boost agricultural production, improve food security, and contribute to achieving the SDGs on zero hunger. Secondly, better skills could help advance the agricultural sector and achieve the long-awaited agricultural transformation in Africa. This suggests that more young people should be encouraged to engage in agripreneurship while developing their skills and capacity for agricultural development. Given this, strategies to mobilize young people, with innovativeness and adventurous attributes, into agriculture should be on the policy priority list of developing countries.

Perception of training as a significant determinant of participation suggests the need to improve youth perception of agricultural-related programmes strategically. In essence, it is imperative to implement strategies that could change young people's negative perception of agricultural intervention for increased participation. Mobilizing young agripreneurs to participate in such programmes necessitates convincing them of the programmes' potential in providing them with valuable incentives and utility for participation. As a result, there is a need to disseminate the findings of studies such as the current one and success stories from existing programmes in workshops designed for young agripreneurs. This is especially important because, as the impact estimates indicate, participation contributes to improved skills, and better skills will invariably help these countries' and other African countries' agricultural development agendas. Similarly, the significance of access to training in improving agripreneurship skills suggests the need to facilitate youths' access to training opportunities via platforms that appeals to young people. For example, stakeholders engaged in youth agribusiness empowerment can use social media to circulate information about empowerment programmes.

Lastly, the significance of the impact estimates suggests the need to raise awareness of youth agribusiness empowerment programmes and encourage more youth to participate in them actively. Also, hands-on training, such as the case study, should strategically target young agripreneurs against the regular one-cap-fit-all programmes. Thus, government and development partners could be more deliberate in designing programmes that meet the training needs of young actors.

Even though this study fills an important gap in the literature and is one of the few to provide empirical evidence on the impact of programme participation on agripreneurship skills, results should be interpreted in the context of the following limitations. First, our sample was drawn from only three of the twelve countries in which the programme was implemented in 2018. Thus, the generalization of results to a broader young agripreneur population in the other areas not covered is limited. Nonetheless, the sample included respondents more relevant to the study's objectives and contributed to an important policy debate in Africa. Second, even though we reviewed a few existing literature to identify relevant factors influencing participation and agripreneurship skills, the list of determining factors included in the model is not exhaustive. Regardless of these limitations, our study contributes to the growing research on youth agripreneurship in cross-national settings. Future research should address these limitations to capture more countries and provide more impact context.

Author contribution statement

Dolapo Adeyanju: Conceived and designed the experiments; Analyzed and interpreted the data; Contributed materials, analysis tools or data; Wrote the paper. John Mburu: Conceived and designed the experiments; Analyzed and interpreted the data; Contributed materials, analysis tools or data; Wrote the paper. Gituro Wainaina: Contributed materials, analysis tools or data; Wrote the paper. Chepchumba Chumo: Conceived and designed the experiments; Wrote the paper. Djana Mignouna: Conceived and designed the experiments; Wrote the paper. Noel Mulinganya: Contributed materials, analysis tools or data; Wrote the paper. Waheed Ashagidigbi: Contributed materials, analysis tools or data; Wrote the paper.

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Appendices.

Table A
Agripreneurship Skills required by Farmers.

Category	Underlying Skills
Professional Skills	- Animal/Crop production - Technical skills
Management Skills	- Human resource management skills - Administrative skills and Financial management
Opportunity Skills	- General planning skills - Risk management skills - Recognizing business opportunity - Threats awareness - Customer and market orientation
Strategic Skills	- Innovativeness - Receiving and using feedback - Strategic planning skills - Monitoring and evaluation skills - Strategic decision-making skills - Conceptual skills - Goal-setting skills - Reflection skills
Cooperation/Networking Skills	- Skills related to cooperating with other farmers and companies - Networking skills - Team working skills - Leadership skills

Source: De Wolf, Schoorlemmer and Rudmann (2007)

Table B
Questions to assess agripreneurship skills.

1.	I am able to recognize business opportunities in agribusiness
2.	I am able to evaluate an agribusiness opportunity and determine if it is viable
3.	I seek advice and information about an agribusiness venture before its actual implementation
4.	I can find creative ways to develop value-added products for income generation
5.	I can develop innovative and creative ways to ensure the success of an agribusiness firm
6.	I am able to develop mental models (plans) on how to turn an agriculture opportunity into a business
7.	I often take calculated risks on new agribusiness ventures (business ideas)
8.	I am able to bear the uncertainties related to my agribusiness enterprise
9.	I often identify risks before or during the implementation of a new agripreneurial activity
10.	I am able to successfully implement an agribusiness enterprise
11.	I take agribusiness challenges as learning opportunities
12.	I always plan and schedule my agripreneurial activities
13.	I am always confident that my agripreneurial activities will succeed
14.	I take responsibility for any outcome of the agribusiness venture(s)
15.	When working on an agribusiness venture, I plan and think about the future
16.	I strive to ensure the sustainability of my agribusiness venture(s)/project(s)
17.	I make rational decisions that align with the future goals of my agribusiness venture(s)
18.	I look for ways to market my agricultural product(s)
19.	I am able to brand and set the right price(s) for my agricultural product(s)
20.	I am able to determine the type of agricultural product(s) that my customers want
21.	I can convince others to buy my agricultural product(s)
22.	I have the skills required to convince someone to fund my agripreneurship idea(s)/venture
23.	I feel comfortable entering into a collaborative agribusiness partnership
24.	If the need arises, I am able to make independent decisions for the success of my agribusiness
25.	I am able to overcome failures resulting from agribusiness projects and start all over again
26.	I do not easily give up when faced with challenges involving my agribusiness
27.	I like being in control of my agribusiness

Table C
Definition of Variables included in the ETER Model.

Variables	Measurement	Hypothesized direction for participation	Hypothesized signs for agripreneurship skills
Explanatory variables			
Age	Age of respondents in years (Continuous)	+	+
Gender	Respondent's gender; 1 = male, 0 = female (Dummy)	+/-	+/-
Education	Years of formal education of respondent (Continuous)	+	+

(continued on next page)

Table C (continued)

Variables	Measurement	Hypothesized direction for participation	Hypothesized signs for agripreneurship skills
Sector of Household head	Sector in which the Household head is currently engaged (1 = Agriculture, 0 = Other sectors)	+	+
Agripreneurship experience	Years of agripreneurship experience (Continuous)	+/-	+
Part-time engagement	Type of engagement 1 = Part time, 0 = Full-time (Dummy)	-	-
Access to training	Have access to agribusiness training; 1 = Yes, 0 = No (Dummy)	+	+
No of HH Agripreneurs	Number of agripreneurs in the household (Continuous)	+	+
Business level	Business level in which the agripreneur is operating; 1 = Start-up, 0 = Others (Growth and Maturity stage) (Dummy)	+	-
Current residence	Current residence 1 = Rural, 0 = Urban	+/-	+/-
Instrumental variable			
Perception of training	How an agripreneur perceives agribusiness empowerment training; 1 = Positive (Beneficial/useful, 0 = Negative (Not useful)	+	

Source: Authors compilation

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