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RURAL E-COMMERCE PROMOTING THE DEVELOPMENT OF SMALL HOLDER FARMERS IN RIVERS STATE, NIGERIA

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ARTICLE INFORMATION	ABSTRAK
	Effective rural e-commerce as a factor of development of small holder farmers in the new era has become a fundamental, crucial, and interesting topic for researchers in the past few decades. And in quest to specifically identify its impacts, challenges and platforms responsible for the promotion and development of small holder farmers operating e-commerce in Rivers State Nigeria, a descriptive survey design comprised of 84 rural small holder farmers with a self-made survey questionnaire was adopted. Using Cronbach Alpha Reliability Coefficient tool, and by analyzing the reliability coefficient, Mean, Standard Deviation and Z-test of the hypotheses, the study deduced that small holder farmers in the area utilizes Facebook, Instagram, YouTube and whatsApp as e-commerce platforms that improves farmers income, performance and enhances agricultural development in the area. Finally, the paper put forward suggestive measures hopeful of ensuring sustainable agriculture, promotes and develop e-commerce operation in the study area. Figure 1 Shown below.

INTRODUCTION

Agriculture haven been proven to be a potential vehicle for economic development in many parts of the globe including Nigeria, consequent of the revolutionary shift from oil exploration to the agricultural sector as evident in the increase in production of rice and other agricultural produce, as result research into the agro field, its commercial and economic significance has surged in the recent decade. Over 70% of Nigerians are employed in agriculture, which accounts for 40% of the nation's GDP and has been the subject of extensive study and

documentation. 80% of GDP comes from crop production, 13% from cattle, 3% from forestry, and 4% from fisheries (Tolulope & Chinonso, 2013).

Figure1. Small Holder Farmers

(Manihot esculenta, commonly called cassava or yuca, is a woody shrub which belong to the spurge family. It is native to South America extensively cultivated as an annual crop in tropical and subtropical regions which is used for food and the related garri of West Africa, serving as the third-largest source of food carbohydrates in the tropics, after rice and maize.)

Likewise, on a larger scale, agriculture is the most practical phenomenon that establishes the different pathways via which domesticated animals, plants, and crops support the world's population by supplying food and other goods for use in industry and consumption (David & Dorian, 2014). It becomes imperative to state that agriculture is a complete package that seeks to alleviate poverty and achieve global food security. However, while agricultural production or activity is perceived to takes place in rural areas where there are vast portion of unused land, rural area as a concept is yet to receive a universal definition, rather it is been described based on population density, and this perception varies from one country to another. According to Nigeria national statistical office under the national bureau of statistics, a settlement with the population of inhabitants in these rural areas are mainly agrarian, which attest to the fact that rural areas are the vocal points of which agricultural activities are carried out, and should serve as vocal point for agricultural advancement.

The concept "Smallholder farmer" also has no universally accepted definition. Small holder farmers are those whose production capacity is between 0.1 and 4.99 hectares of farm land, according to Federal Office of Statistics (1999) (Mgbenka, Mbah, & Ezeano, 2015). Another definition of smallholder farmers includes those who manage lands ranging from less than one hectare to ten hectares and include pastoralists, small-scale farmers, forest guardians, and fishermen (FAO, 2013). According to reports, smallholder farmers in Nigeria account for more than 80% of all farmers (Mgbenka & Mbah, 2016). Notably, smallholder farmers manage over 80% of the estimated 500 million farms globally and provide over 80% of the food consumed in a significant portion of the developing world. As such, they play a critical role in the fight against poverty and guaranteeing food security. According to records, smallholder farmers in Latin America account for over 35% of all cultivated land (United Nations Environment Programme, 2013).

The foundation of Nigeria's agricultural industry are smallholder farmers, who should receive all the assistance they need to increase food production, increase the number of raw materials they grow for the agro-industrial sector, and help close the food supply imbalance that costs the nation US$10 million in food imports each year (Adebowale et al., 2021).

Small farmers face a number of difficulties despite their importance to economic growth, including their small farms' size restrictions, their ability to obtain financial assistance and subsidies, the effects of climate change, price spikes and volatility, and their lack of access to contemporary markets that allow them to buy and sell agricultural products. Moreover, it has

been noted that one of the main issues with Nigeria's agricultural produce marketing is the rising cost of transportation. Smallholder farmers, particularly in developed and emerging nations, have embraced e-commerce as a means of addressing the commercial issue in agriculture.

E-commerce as medium of business has been described differently by so many authors, e-commerce has been described as the distribution of commercial info, preserving of commercial relations and leading business dealings by means of telecommunication broadcasting (Shafiyah et al., 2013). Furthermore, the term "e-commerce," also referred to as "electronic commerce" or "online commerce," refers to the exchange of money and data via the internet in order to complete transactions for products and produce (Hans, 2023). In the business sector, e-commerce is primarily defined as a relatively new system or paradigm that replaces traditional or direct trade with electronic commerce, which runs on information and communication technology (ICT). Consequently, social commerce and e-market, brand website, e-retailer, and other platforms are used for e-commerce activities. Previous research has shown that selling on Facebook enables small and midsize enterprises, also known as SMEs, and new entrepreneurs to launch their businesses at low-cost investment with an easy-to-use function to assess target groups. On the demand side Facebook, Shopee, Lazada and LINE are the most popular platforms for online shoppers to purchase goods and services. (Apichaya, 2020).

Farmers can boost farm income and productivity in this e-commerce scenario by utilizing the internet's ability to reduce transaction costs. The importance of e-commerce in the development of small-holder agriculture cannot be overstated. The internet's availability offers farmers encouragement and a renewed sense of hope (Ashok, Robert, & Joshua, 2010). In addition, the e-commerce system has changed the way that businesses transact. For example, it now costs less for buyers and sellers to transact, transactions are easier because there are no time or location constraints, there are more promotional and alternative options available, and there is a chance to increase market share without spending a lot of money. In this way, the internet will encourage communication with a larger pool of suppliers and customers and make it easier to obtain information about prices and products (Dariusz, 2015). This is seen to have the potential to improve the flow of agricultural products and development, facilitate more seamless communication and better experiences, and support price discovery and market transparency.

However, there are a number of obstacles that smallholder farmers must overcome in order to use e-commerce in rural areas. These obstacles include, but are not limited to, cost, customer risk aversion, delivery time, delivery quality, trust, and sociodemographic and business characteristics. Additionally, farmers using e-commerce face challenges such as low computer proficiency, risk aversion and distrust towards online transactions, unappealing prices akin to traditional market rates, inadequate broadband for Internet access, issues with evaluating product quality, issues with the timeliness of offers in the electronic marketplace, a lack of transaction history, and discontent with the current partnership with traditional livestock agents (Wilm, Michael, & Oliver, 2018). Many authors have conducted research in this field because of the importance of rural e-commerce to agriculture; nevertheless, there hasn't been much research done on rural e-commerce in Rivers State, Nigeria, the subject of this research paper. Thus, the focus of this study is on how rural e-commerce in Nigeria's Rivers State supports the growth of small businesses. Table 1 shown below.

Table 1. Nigeria Rural Population Data 2000-2022

Year	Population	% in Total	Change
2000	80,050,353	65.16	1.78%
2001	81,155,279	64.33	1.37%
2002	82,274,855	63.49	1.37%
2003	83,391,568	62.64	1.35%
2004	84,499,321	61.79	1.32%
2005	85,595,377	60.93	1.29%
2006	86,680,126	60.06	1.26%
2007	87,761,889	59.18	1.24%
2008	88,835,953	58.3	1.22%
2009	89,904,757	57.41	1.20%
2010	90,970,553	56.52	1.18%
2011	92,054,100	55.63	1.18%
2012	93,123,376	54.75	1.15%
2013	94,145,930	53.88	1.09%
2014	95,103,167	53.02	1.01%
2015	95,975,881	52.16	0.91%
2016	96,818,209	51.32	0.87%
2017	97,678,669	50.48	0.88%
2018	98,511,358	49.66	0.85%
2019	99,300,013	48.84	0.80%
2020	100,084,652	48.04	0.79%
2021	100,840,661	47.25	0.75%
2022	101,575,770	46.48	0.73%

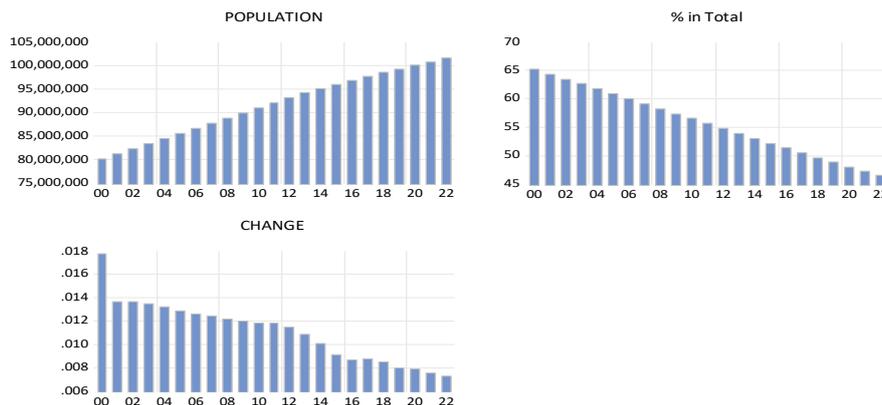Source: World Bank by Macrotrends (2023).

Figure 2 Shown Below.

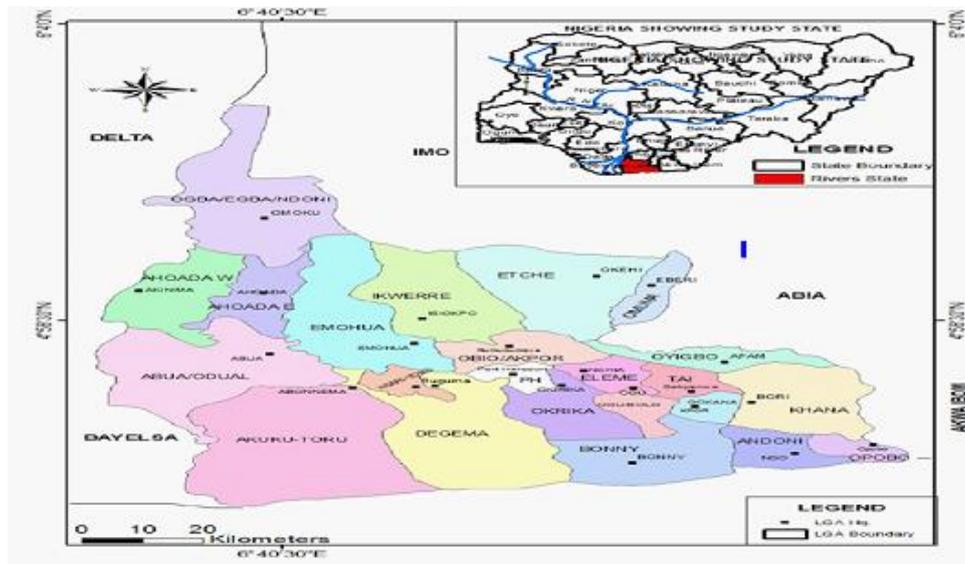**Figure 2.** Graphical distribution of Nigeria Rural Population 2000-2022

Figure 3. Map showing study area Adopted from Naluba & Arokoyu (2015)

Objectives used in the study are,

- To evaluate how rural e-commerce initiatives affect Nigeria's Rivers State's smallholder farmers' economic growth.
- To examine the role of Climate and Environmental Factors in shaping agricultural practices and overall development outcomes of smallholder farmers in the study area.
- To look into how smallholder farmers' ability to improve agricultural productivity and livelihoods is related to their access to information and training. Figure 3 Above shown.

LITERATURE REVIEW

Study Area E-Commerce

In the recent decade, there have been several studies on e-commerce with divergent opinions and interest, but relatively few research has been conducted in the research area on the paper. According to a study done in the Nigerian state of Rivers in the city of Port-Harcourt that particularly looked at how e-marketing affected the performance of retail stores that catered to the population of people who visited online retailers. Following a thorough investigation, they arrived at the following findings: online retail outlets' marketing techniques are influenced by the electronic environment, but these firms are not impacted by dangers related to money, product delivery, information, or security. Therefore, the quality of e-marketing has a significant influence on consumers' behavior when it comes to how they perceive the value of products, the standard of e-services, costs, and customer service (Aja, Prince, & Johnson, 2017). Previous research in this field has concentrated on the real-world contributions of ICT to the empowerment of Nigerian rural women farmers in Rivers State. The ADP (Agricultural Development Project) Office in the study area gave a list of farmers, and 120 of these women farmers were carefully picked to participate in the study with the sole purpose of examining their demographics. The findings of their research shed light on the important ways that ICTs can empower rural women by fostering entrepreneurship, reducing poverty and illiteracy, facilitating small and medium-sized businesses, and increasing their income and savings (Tijjani & Anaeto, 2017).

Nigeria E-Commerce

It is a clear fact that the generic use of the internet has placed the dissemination of information on a fast pace, bringing several sectors of the world at our finger tips which include, but not limited to, the commercial sector. Nigeria has been identified as a country with high developmental prospects, enough human and material resources to build, automate, sustain, and grow its commercial sector, and the ensuing effect of agriculture, of which a sizable portion is run by small-holder farmers and who's medium of distribution is linked to the operations of e-commerce, makes the acceptance and operation of e-commerce in the nation absolutely necessary.

Despite Nigeria's large population, which would have benefited from the system, e-commerce faced a number of adoption issues when it was first introduced. These issues included the operator's struggle to self-provision internet services at their own expense, as a result of the government's limited support, and a lack of infrastructure. From research on the adaption factors of e-commerce in Nigeria, covering over150 participants, it was gathered that poor infrastructural facilities are the major factors hindering e-commerce adoption among Nigerians (Solomon et al., 2014). A 2020 study examining the benefits and drawbacks of e-commerce in Nigeria discovered that the primary benefits of its adoption were higher sales, a competitive edge, customer loyalty, increased process automation, broader use of new technology, improved knowledge management, improved well-being, and customer education. Frequent power outages, insecurity, expensive technological expenses, mistrust of online retailers, software compatibility, and the requirement to hire IT specialists were found to be the top drawbacks (Ugo & Awulika, 2020) The most widely used electronic payment mechanism in the nation is the ATM, which is not the best option for e-commerce implementation because one of the primary barriers to e-commerce implementation in Nigeria is the extremely low Internet penetration rate in the country. In spite of this, a group of academics examined the possibility of e-commerce adoption and growth-promoting factors in Nigeria using the political, economic, social, and technical (PEST) analysis technique (Ayo, 2008)

Foreign E-Commerce

To keep up with the growth of rural e-commerce, research has been done on how to increase the carrying capacity of rural logistics. They hypothesis that the model has a notable positive result evident in the high matching precision capable of increasing the demand for rural e-commerce in the area based on a study done in the Guangdong Province of China that used weakening buffer operators to forecast the demand for rural logistics (Minling et al., 2022). Comparably, a team of Chinese researchers in the Zhejiang province looked into how e-commerce affected the disparity in income between urban and rural areas. Using an empirical analysis of 11 cities in the province, their findings also revealed an inverted-U relationship between the growth of e-commerce and the income gap between urban and rural areas, with the latter still veering toward the left side of the inverted-U curve (Lili et al., 2021). Using the BRICS (Brazil, Russia, India, China, and South Africa) as a case study, Karine Haji conducted a thorough, methodical, comparative, and normative analysis of the ways that rural e-commerce promotes rapid, equitable, and sustainable economic growth while also raising living standards and reducing poverty in rural areas. The study concluded that despite the countries' remarkable rapid growth in e-commerce and the vast opportunities it created, there are still issues with disproportionate e-commerce in various target area regions (Karine, 2021).

Research Questions

1) What are the rural e-commerce platforms promoting the development of small holder farmers in the new era in Rivers State, Nigeria?
2) In Rivers State, Nigeria, how does rural e-commerce contribute to the advancement of small-holder farmers in the modern era?
3) What are the challenges of small holder farmers in operating rural e-commerce in the new era in Rivers State?

Hypotheses

Hypothesis 1:

Null Hypothesis (H0): There is no significant direct effect of Rural E-Commerce Initiatives on the Development of Small Holder Farmers.

Alternative Hypothesis (H1): Rural E-Commerce Initiatives have a positive and significant direct effect on the Development of Small Holder Farmers.

Hypothesis 2:

Null Hypothesis (H0): The relationship between Climate and Environmental Factors and the Development of Small Holder Farmers is not influenced by Trust in E-Commerce Platforms.

Alternative Hypothesis (H1): Trust in E-Commerce Platforms mediates the positive relationship between Climate and Environmental Factors and the Development of Small Holder Farmers.

Hypothesis 3:

Null Hypothesis (H0): Farmers' Digital Literacy does not moderate the relationship between Access to Information and Training and the Development of Small Holder Farmers.

Alternative Hypothesis (H1): Farmers' Digital Literacy moderates the positive relationship between Access to Information and Training and the Development of Small Holder Farmers in Rivers State, Nigeria.

Empirical Reviews

To investigate e-commerce in agriculture, a discrete choice experiment concerning the purchase of crop protection items was carried out. Primary data was collected, and 165 farmers' selection decisions were analysed using a generalized multinomial logit model (GMNL), which produced an estimate of the willingness to accept (WTA) space. According to WTA estimates, farmers are prepared to move to an internet retailer if the price difference is substantial (Grant, 2020). However, farmers' willingness to pay an online merchant is unaffected by word-of-mouth recommendations and advice from traditional media sources. On the other hand, for online purchases of inputs, farmers' WTA is considerably impacted by delivery time. We also show that the risk attitudes of farmers, their past online shopping experiences, and their educational background are some of the factors that significantly impact the WTA for an online merchant. The study's findings offer excellent advice to online agriculture retailers on how to choose a suitable marketing plan. Surprisingly, farmers' WTA is unaffected by age or the size of their property. This is due to the fact that e-commerce is still relatively new in the agriculture sector. Additionally, the research's conclusions are pertinent for creating educational policies that are not just limited to the study location but may be used elsewhere. The study covers both e-commerce and agricultural, thus the results are relevant in that regard as well, even though the demographic and kind of respondents vary.

RESEARCH METHODS

Research Purpose

This study's main goal is to get more data about how rural e-commerce activities affect Nigeria's smallholder farmers in Rivers State's overall economic development and well-being. In the context of a shifting technological landscape, the research aims to provide insights into the potential benefits and challenges faced by smallholder farmers by examining the effects of digital interventions, such as e-commerce platforms, on income generation, market access, and agricultural practices.

The goal of the project is to investigate how social capital, digital literacy, information and training availability, and environmental factors interact to shape the results of rural e-commerce operations.

Participant Selection

A stratified random selection technique will be used in the study to choose smallholder farmers from various parts of Nigeria's Rivers State. There will be about 250 participants in all, which will provide representation from a range of rural locations. Geographical location (coastal, inland) will be the basis for stratification in order to capture a variety of agricultural and climatic variables.

Data Collection Instruments

One important tool in this research is the survey questionnaires, which were created with the primary goal of gathering quantitative data to fully comprehend the many aspects of the study.

The questionnaires' main goals are to gather important demographic data, specifics about the participants' economic activities, their degree of access to rural e-commerce, and their opinions of the results of progress. The surveys' content is thoughtfully organized, with closed-ended questions that include multiple-choice and Likert scales.

The instrument was partitioned into three sections (A-C). The pattern utilized in structuring the instrument was based on the Likert 5-point rating scale, which includes the categories of Strongly Agree (SA-5), Agree (A-4), Undecided (U-3), Disagree (D-2), and Strongly Disagree (SD-1) (Sorrel, 2023).

Data Types

In the study's demographic component, measurable variables like age are represented by numeric data, while non-numeric qualities like gender and educational attainment are represented by categorical data. This mix of data kinds makes it possible to fully comprehend the features of the participants, which makes quantitative analysis in the research easier.

Data Analysis Methods-Quantitative analysis involved

Using correlation analysis to examine the interrelationships between variables is a crucial method in quantitative research. By scrutinizing how variables relate to one another, researchers can gain valuable insights into the underlying patterns and dynamics of the phenomena under investigation.

This analytical approach is facilitated by software tool names SPSS and other statistical analysis tools, enables scholars to uncover the potential associations, dependencies, or interactions among different variables. By employing correlation analysis, researchers can

determine the strength and direction of the relationships between variables, ultimately contributing to a comprehensive understanding of the research topic.

In quantitative research, hypothesis testing plays a pivotal role in evaluating the evidence present in sample data. This rigorous method allows researchers to examine the relationship between variables and assess whether there is sufficient empirical evidence to draw meaningful inferences.

RESULTS

Demographic Information

The Table 2 presented provides insights into the demographic and agricultural characteristics of a sample population.

- *Age:* When it comes to age distribution, the highest percentage of the population—31.2%—lies in the 26–35-year-old age group. The group of people who are between the ages of 36 and 45, which makes up 30.4%, comes in just behind. Those between the ages of 18 and 25 make up 7.2% of the population, but those between the ages of 46 and 55 and 56 and over make up 21.6% and 9.6%, respectively.
- *Gender*: In the sample population, the gender distribution is split equally between male and female respondents, with each group accounting for 50% of the total respondents. This indicates that men and women were fairly represented in the poll.
- *Farm size:* Regarding the area of agricultural land, the information gathered makes it abundantly evident that a sizable fraction of the participants—42 percent—manage small-scale farms. These small-scale farms are specifically described as comprising a land area that is less than one hectare. On the other hand, a little greater proportion of the participants, 45.6%, are engaged in the management and development of medium-sized farms, encompassing an area ranging from 1 to 5 hectares.
- *Location:* Geographically, the survey successfully includes a thorough and balanced sample of respondents from both inland and coastal areas, guaranteeing a just and equal representation of viewpoints. In particular, an astounding 50.4% of the participants live in coastal regions, with the remaining 49.6% residing inland. This harmoniously balances these two very different geographic places.

These findings offer a comprehensive overview of the surveyed population, shedding light on age, gender, farm size, and geographic distribution.

Table 2. Demographic Information

	Category	Frequency	Percent
Age	18-25 years	18	7.2
	26-35 years	78	31.2
	36-45 years	76	30.4
	46-55 years	54	21.6
	56 and above	24	9.6
Gender	Male	125	50.0
	Female	125	50.0
Farm size	Small farms (less than 1 hectare)	105	42.0
	Medium farms (1-5 hectares)	114	45.6
	Large farms (5 hectares and above)	31	12.4
Location	Coastal areas	126	50.4
	Inland areas	124	49.6

Descriptive Statistics

The variables DSHF, RECI, CEF, AIT, SCNP, TECP, and FDL are described in Table 3. These variables average 3.6512 to 3.8432. DSHF has a better mean score of 3.8432 than TECP, which is 3.6512. Means show the sample's average reaction. The standard deviations for each variable range from 0.88637 to 0.91908. The standard deviation measures data point spread around the mean. Standard deviation values for DSHF, RECI, and SCNP show more response variability than other variables. N for each variable is steady at 250, indicating a homogenous sample size. In conclusion, mean scores fluctuate slightly, while standard deviations show various reactions.

Table 3. Descriptive statistics

	Mean	Std. Deviation	N
DSHF	3.8432	.91908	250
RECI	3.7984	.90443	250
CEF	3.7736	.88637	250
AIT	3.7544	.89119	250
SCNP	3.7728	.90986	250
TECP	3.6512	.88682	250
FDL	3.7792	.89759	250

Reliability Test

The Cronbach's Alpha reliability coefficient and item count for DSHF, RECI, CEF, AIT, SCNP, TECP, and FDL are shown in Table 4. Internal consistency reliability is measured by Cronbach's Alpha, which shows how effectively scale or questionnaire questions measure the same construct. Each variable in DSHF, RECI, CEF, AIT, SCNP, TECP, and FDL has five components. Cronbach's Alpha scores of .978 imply high scale item internal consistency. Good internal consistency means items in each variable measure the same construct with a Cronbach's Alpha near 1.0. good Cronbach's Alpha values (.978) suggest good DSHF, RECI, CEF, AIT, SCNP, TECP, and FDL item consistency. Reliable scales or variables capture psychological or behavioural constructs, providing researchers and practitioners confidence in the results. Overall, variable evaluations show excellent internal consistency.

Table 4. Reliability Test

	N of items	Overall Cronbach's Alpha
DSHF	5	
RECI	5	
CEF	5	
AIT	5	.978
SCNP	5	
TECP	5	
FDL	5	

T-Test

Comparison of variable means statistics presented in Table 5. Possibly ANOVA or t-test. The "Test Value" of 0 determines if variable means differ considerably. Variables have test statistics, mean differences, confidence intervals, degrees of freedom (df), and significant level. All variables (DSHF, RECI, CEF, AIT, SCNP, TECP, and FDL) have significant test statistics

with 249 degrees of freedom and 65.099 to 67.315 ranges. Each test statistic has 0.000 P-values, indicating significant significance. Variable means differ statistically, refuting the null hypothesis of equal means. Mean differences reveal group differences in each variable. The mean difference for DSHF is 3.84320, with a 95% confidence interval of 3.7287 to 3.9577. Similar information is supplied for RECI, CEF, AIT, SCNP, TECP, and FDL. Finally, statistical analysis shows substantial mean differences in DSHF, RECI, CEF, AIT, SCNP, TECP, and FDL.

Table 5. T-Test

					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
DSHF	66.116	249	.000	3.84320	3.7287	3.9577
RECI	66.404	249	.000	3.79840	3.6857	3.9111
CEF	67.315	249	.000	3.77360	3.6632	3.8840
AIT	66.610	249	.000	3.75440	3.6434	3.8654
SCNP	65.563	249	.000	3.77280	3.6595	3.8861
TECP	65.099	249	.000	3.65120	3.5407	3.7617
FDL	66.572	249	.000	3.77920	3.6674	3.8910

Test Value = 0

Hypothesis Test

Testing of Hypothesis 1

The investigation of Hypothesis 1 involves the use of regression analysis to identify patterns and relationships among factors being studied. Researchers can use regression analysis to evaluate the significance and strength of the connection associated with Hypothesis 1. Table 6 is used to present the statistical measures of a regression model.

The summary statistics in Table 6 provide insights into the performance and explanatory power of the regression model. The correlation coefficient (R) shows a strong linear relationship between predictor variables and the response variable. The coefficient of determination (R Square) indicates that 79.7% of the variability in the response variable is explained by the predictor variables. The Adjusted R Square accounts for the number of predictors and shows that 79.3% of the variability in the response variable is accurately explained. The Std. Error of the Estimate represents the model's precision in predicting the response variable. These metrics verify that, thanks to the included predictor variables, Model 1 has a great overall fit and is capable of fully capturing and explaining a sizable percentage of the variance in the response variable.

Table 6. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.893a	.797	.793	.41791

Table 7 presents what seems to be the findings of an analysis of variance (ANOVA) conducted on a regression model.

Table 7. ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	167.544	4	41.886	239.830	.000b

Residual	42.789	245	.175
Total	210.333	249	

Table 7 provides a thorough grasp of the model's performance based on the insightful results of the regression analysis. The regression component, with four degrees of freedom, had a sum of squares, or the squared differences between the mean of the dependent variable and the predicted values, of 167.544. As a result, the average variance explained by the regression model was determined to be 41.886, or mean square. The model's overall goodness of fit was revealed by the F-statistic, which stood at 239.830, and the highly significant p-value of.000b. With 245 degrees of freedom and a sum of squares of 42.789, the residual component—which represented the unexplained variability—showed a mean square of.175. With 249 degrees of freedom, the dependent variable's overall variability (including residual sum of squares and regression) was 210.333. When taken as a whole, these statistics demonstrate the regression model's statistical significance and effectiveness in explaining and forecasting the observed data patterns.

Testing of Hypothesis 2
To evaluate Hypothesis 2, a mediating analysis is used as the investigative approach to explore potential mediating factors that explain the relationship between the independent and dependent variables. This method allows scientists to gain a deeper understanding of the suggested relationship by studying the underlying mechanisms and pathways involved.

The correlation coefficient (R) in table 8 shows a strong positive linear relationship, indicating the strength and direction of the association. The coefficient of determination (R-sq) is 0.6770, meaning that around 67.7% of the variability in the dependent variable is explained by the regression model. This suggests a high level of predictability in the model's ability to account for observed variations. The mean squared error (MSE) is low at 0.2586, indicating that the model's predictions are precise with minimal deviations from the observed values. The F-statistic of 258.8151 is highly significant (p = 0.0000), highlighting the overall effectiveness of the regression model in explaining the variance in the dependent variable. The degrees of freedom (df1 = 2.0000 and df2 = 247) provide additional context for the F-statistic.

Table 8. Model summary

R	R-sq	MSE	F	df1	df2	p
.8228	.6770	.2586	258.8151	2.0000	247	.0000

The regression analysis in table 9 reveals significant insights into the impacts of DSHF and TECP on the dependent variable. A one-unit increase in DSHF is associated with a 0.6009-unit increase in the dependent variable. The relationship is statistically significant with a high t-statistic and low p-value. The confidence interval for the DSHF coefficient provides a range for estimating the true population coefficient. Similarly, a one-unit increase in TECP is associated with a 0.2450-unit increase in the dependent variable. The association is statistically significant with a significant p-value. The confidence interval for the TECP coefficient offers a range containing the true population coefficient. Overall, these findings contribute to understanding the contributions of DSHF and TECP to the dependent variable.

Table 9. Model

	Coefficient	SE	t	p	LLCI	ULCI
DSHF	.6009	.0553	10.8742	.0000	.4920	.7097

TECP	.2450	.0573	.2783	.0000	.1322	.3578

Testing of Hypothesis 3

The chosen method for assessing Hypothesis 3 is a moderating analysis. This technique investigates the effects of a third moderating variable on the link between independent and dependent components. Employing moderating analysis allows researchers to uncover variations in the relationship under different conditions, providing insight into influencing factors. This analysis yields a context-specific understanding of Hypothesis 3.

The regression analysis of table 10 shows a significant relationship between predictor variables and the dependent variable. A strong positive linear relationship is observed, with 68.9% of the dependent variable's variance explained by the regression model. Precise predictions are indicated by the low mean squared error. The F-statistic emphasizes the effectiveness of the regression model in capturing variability and the reliability of the model for explaining and predicting data.

Table 10: Model summary

R	R-sq	MSE	F	df1	df2	p
.8302	.6893	.2498	181.8984	3.0000	246	.0000

The valuable insights into the relationships between the predictor variables and the dependent variable are provided by the regression coefficients presented in Table 11 below. The statistical significance of the constant term, with a coefficient of -0.0963, is lacking ($p = 0.8472$), suggesting that its impact may not deviate from zero. Shifting focus to the predictor variables, it can be observed that DSHF has a significant positive influence (coefficient = 0.6895, $p = 0.0002$), indicating that a one-unit increase in DSHF corresponds to a 0.6895-unit increase in the dependent variable. Similarly, FDL exhibits a significant positive effect (coefficient = 0.5944, $p = 0.0007$), implying that a one-unit increase in FDL leads to a 0.5944-unit increase in the dependent variable. The confidence intervals associated with these coefficients provide ranges within which the true population coefficients are likely to exist. In summary, these findings offer valuable insights into the individual impacts of the variables on the dependent variable within the regression model. Top of Form

Table 11. Model

	Coefficient	SE	t	p	LLCI	ULCI
constant	-.0963	.4991	-.1929	.8472	-1.0793	.8868
DSHF	.6895	.1836	3.7546	.0002	.3278	1.0512
FDL	.5944	.1737	3.4224	.0007	.2523	.9365

DISCUSSIONS

The drive of the education was to examine how e-commerce stages in rural areas affect small-scale farmers' advancement in the modern era. The study findings have the potential to add to the current discussion by offering empirical evidence that either validates or refutes the hypotheses, so aiding in the assessment of their soundness. In the event that the results show a statistically significant positive correlation, they would highlight how crucial rural e-commerce initiatives are to helping Rivers State's smallholder farmers expand.

According to the first hypothesis, smallholder farmers' advancement is not significantly impacted directly by rural e-commerce initiatives. The alternative theory, however, suggested a direct effect that was both significant and favourable. The study's conclusions may add to this conversation by offering actual data that either validates or invalidates this theory. Should the findings show a statistically significant positive correlation, this would highlight the contribution that rural e-commerce projects make to the growth of smallholder farmers in Rivers State.

The second hypothesis presented the idea of e-commerce platform trust as a potential mediating factor in the interaction between environmental and climatic conditions and smallholder farmers' progress. The research may explore the ways in which the positive correlation between environmental conditions and smallholder farmers' development can be influenced or mediated by trust in e-commerce platforms. The question of whether trust serves as a stimulant to increase the positive effects of environmental factors and a favourable climate on farmer growth should be discussed.

According to the third hypothesis, the relationship between smallholder farmers' development and information and training availability is moderated by farmers' digital literacy in conjunction with these resources. According to this hypothesis, farmers' levels of digital literacy affect how information and training affect their development. The conversation might go into how digital literacy affects how well information and training programs work to support the development of smallholder farmers.

It is crucial to evaluate the study's results in the context of these theories in the discussion section, going over whether the data confirms or refutes each theory. To offer a thorough understanding of the role of rural e-commerce in the growth of smallholder farmers in Rivers State, Nigeria, it could also be beneficial to investigate potential implications, constraints, and options for future research. The practical implications of the findings and their applicability to practitioners, policymakers, and other stakeholders engaged in e-commerce and rural development projects should also be emphasized in the discussion.

CONCLUSION

In conclusion, the study has yielded valuable visions into the multifaceted interconnections between rural e-commerce undertakings and the advancement of smallholder farmers in the region. The investigation aimed to examine three hypotheses, each addressing distinct facets of the interplay between e-commerce, environmental factors, digital literacy, access to information, and the progress of smallholder farmers. The results of this study significantly advance our understanding of how smallholder farmers are affected by rural e-commerce. All of the results point to the importance of digital literacy, trust in online platforms, and rural e-commerce in supporting the development of smallholder farmers in Rivers State.

The implications of this study extend to policymakers, practitioners, and stakeholders engaged in agricultural and rural development, underscoring the necessity for targeted interventions that harness the potential of e-commerce initiatives while taking into account the mediating and moderating factors identified in this research. Fundamentally, this research adds to the ongoing discourse on rural development and e-commerce, presenting valuable insights that can inform strategies aimed at enhancing the livelihoods of smallholder farmers in Rivers State and similar agricultural landscapes.

Recommendations

The following recommendations were made:

- State governments should conduct seminar for small holder farmers on the significance of e-commerce in agricultural development so as to sensitize them and to increase the number of small holder farmers operating e-commerce thereby ensuring sustainable agriculture in the study area.
- Federal government should provide smart phones with internet facilities to small holder farmers in rural areas that will be used in operating e-commerce at the rural areas in the study area.
- Federal and state government should provide alternative power supply to rural small holder farmers to help power their electronic facilities for e-commerce transaction in the rural areas, especially in the study area.
- The government should prioritize addressing the areas where the expansion of e-commerce exacerbates the economic gap between rural and urban areas, pass legislation to improve the conditions that will encourage rural e-commerce, and work to reach the tipping point in rural areas.

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