



Research Paper

Effect of Infrastructural Deficits on Food Security in Kogi State, Nigeria

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Abstract

This study examines the effect of infrastructural deficits on food security in Kogi State, Nigeria. The study measured infrastructural deficits with power infrastructural deficits, transport infrastructural deficits and health infrastructural deficits. The study adopted descriptive survey research design and primary data were collected with the aid of questionnaire designed in a four Likert scale manner to extract information from the farmers in Kogi State, Nigeria. The population of the study is 4,473,600. This study employs scientific sampling technique determination of Krejcie and Morgan (1970) that recommends a sample size of 384 for a population above 4 million. Ordinary least square regression analysis was employed to analyse the data. The study revealed that power infrastructural deficits, transport infrastructural deficits and health infrastructural deficits have negative significant effects on food security in Kogi State, Nigeria. Based on these findings, the study concludes that poor infrastructure including poor power supply, poor transportation system and poor access to health care cause food insecurity in Kogi State, Nigeria. If infrastructure is improved, more food will be available in the market and the food insecurity levels can go down. The study recommends that Federal and State Government should spend more on these critical infrastructures such as the transport, power and health by focusing on the rural areas. It can help revitalize rural neighbourhoods by providing access to adequate, safe and nutritious food.

Keywords: *Infrastructural Deficits, Food Security, Power Infrastructural Deficits and Transport Infrastructural Deficits.*

I. Introduction

The importance of agriculture to human survival cannot be overemphasized and this is because it provides food for the world over. For any society to develop and thrive in its agricultural sector there must be on ground requisite infrastructures to aid the development of the sector. However, the issue of food security has been on the front burner for long and statements about several countries in Africa that are food insecure. There have been horrific photographs of starving children in some African countries such as Somalia, Uganda, Niger, Ethiopia, some parts of Kenya, among others. These frightening photographs depict an avoidable disaster. The state of Nigeria's infrastructure poses a great challenge to food security. The decay of infrastructure overtime have made it difficult for the country to ensuring adequate food security; speaking of bad roads, unstable power supply, inadequate health system, and poor education infrastructure (Ogunleye *et al.*, 2018)

In Nigeria, food accounts for a large and increasing share of family budgets for rural and urban families. If prices of staple foods soar, poor people bear the brunt. As clothing and shelter serves as the basic necessities of life, food remains the most vital because of its centrality to human existence. It is a known fact that the ruthless expedition for food has shaped human history, provoking wars, driving migration and underpinning the growth of nations. The recent escalation of food prices in Nigeria call for sober reflection, due to challenges facing the country such as insecurity, infrastructural deficits and climate change (Emokaro & Oyoboh, 2016).

Recent literature indicates the significance of infrastructure in improving food security in developing economies (Anderson & Shimokawa, 2006). Infrastructural facilities are basic services without which the needed environment as well as primary, secondary and tertiary productive activities will not be able to function. Infrastructural facilities can be physical such as roads, water, rural electrification, storage and processing

facilities, social infrastructure such as health and educational facilities, community centres, fire and security services and institutional infrastructure like credit and financial institutions, agricultural research facilities.

Availability of adequate infrastructure facilities is an important pre-requisite for sustainable food security. Food security depends on good infrastructural facilities and is an instrument to improve the economy. But most developing countries including Nigeria still suffer from poor rural infrastructural facilities (Olayiwola & Adeleye, 2005). Even though, Nigeria government initiated several projects to improve the quality and quantity of infrastructure in the rural areas through programmes such as the establishment of eleven River Basin Development Authorities (RBDAs), Directorate for Food, Roads and Rural Infrastructure (DFRRI), the Poverty Relief and Infrastructure Investment Fund and the Comprehensive Agricultural Support Programme, the impact of such programmes on the lives of many rural people in the country is still considered to be limited (Ahmed *et al.*, 2010).

Several studies have noted that poor infrastructure is the main obstacle to food security in Africa (Limão & Venebles, 2001; Buys *et al.*, 2010). Studies have also shown that the presence of roads in rural areas reduces poverty in connected villages by integrating labour and goods markets, thereby providing new economic opportunities to local inhabitants. For example, farmers are able to obtain higher profits as a result of cheaper agricultural inputs and higher farm-gate prices. Increased government expenditure is needed in agricultural infrastructure to improve food security, and particularly to reduce food loss.

Ironically, the dearth of literature on power in this clime (Matemilola *et al.*, 2019; Tijjani *et al.*, 2013) as an infrastructural deficit triggering food insecurity calls for concern and could also be responsible for the volatile and low patronage of foreign direct investment in the country's agricultural hemisphere. Emerging technology in renewable energy are hardly deployed towards Nigeria and when done they are not projected enough to create the needed agricultural paradigm shift.

The sets of constructs employed to explain food security varies across empirical studies of both developed economies (Tuttle & Beatty, 2017; Bradbury *et al.*, 2017; Arndt *et al.*, 2019) and developing economies (Matemilola *et al.*, 2019; Babagana *et al.*, 2019; Muhammad & Sidique, 2019; Oyetunde-Usman & Olagunju, 2019) none of these reviewed by this study deployed these unique constructs; power infrastructural deficit, transport infrastructural deficit and health infrastructural deficits to explain food security challenges in their study.

The study's main objective is to probe the effect of infrastructural deficit on food security in Kogi State. Other specific objectives are:

- i. Examine the effect of power infrastructure deficit on food security in Kogi State.
- ii. Determine the effect of transport infrastructure deficit on food security in Kogi State.
- iii. Investigate how health infrastructure deficit affects food security in Kogi State.

This study is on effects of infrastructural deficits and food security in Kogi State. Thus, the study is limited to twelve (12) local government areas of the twenty-one Local Government Areas of Kogi State, these eight local governments are considered within the periods 2012 to 2021.

Conceptual Framework

Infrastructural Deficit

Infrastructure generally refers to basic structures, systems and facilities that enable accomplishment of social and economic goals. Such includes public goods; roads, highway safety and standards, mass transit and sea and airport facilities, railway systems, electricity, water supply systems, telecommunication, waste treatment facilities, drainage and sewage disposal systems, postal services, correctional institutions, education facilities, public health delivery systems, health and safety emergency response systems, housing and security (Hope, 2018).

From the foregoing, it is obvious that the World has agreed that infrastructural development is a statutory expectation of the government to manage a state's social and economic resources for infrastructural development. Noting this, it's either government act its role in delivering adequate quality infrastructure or becomes a hole through which infrastructural deficit is inflated in the system.

Food Security

Food security according to Food and Agricultural Organisation (FAO) (2011) exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for active and healthy life. Thus, to achieve food security in Nigeria is a task that requires a holistic approach in terms of commitment, knowledge and skills acquisition by all categories of individuals especially the youths at all levels of education. Food security is usually framed in four dimensions food availability, access to food, food use, utilization and food stability (FAO, 2016a).

Food security refers to the availability of food and one's access to it. A household is considered food secure when it occupants do not live in hunger or fear of starvation (FAO, 2011). Food security exists when all

people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life (Idachaba, 2006).

Empirical Review

Power Infrastructure Deficit and Food Security

Ali *et al.* (2012) analysed the vital character of renewable energy on agriculture in rural India. The study established that renewable energy and farming are a winning combination. Wind, solar, and biomass energy can be harvested forever, providing farmers with a long-term source of income as it powered the farming and storages. While the study of Tijjani *et al.* (2013) examined the role of renewable energy sources in agricultural sector as a means of enhancing sustainable food security in the country. The study concluded that poor agricultural produce wastage and other agricultural products also suffer as a result of lack of energy in the country.

Tuttle and Beatty (2017) investigated the effects of energy price shocks on household food security in low-income households such that unexpected changes in energy prices. Findings revealed that an unexpected rise in the prices of gasoline, natural gas, and electricity increases the probability of food security problems, while an unexpected drop in the price of each energy source decreases the probability. The study conducted by Arndt *et al.*, (2019) examined the potential deposits of developing countries and the vastly untapped renewable energy. The study established that despite these challenges, there is ample reason to believe that variable renewable will attain very high levels of penetration into energy systems, particularly in regions well endowed with solar and wind potential.

Matemilola *et al.* (2019) analysed the bio-energy potential of Nigeria and the implications of the fast-rising market on food security in the Nigerian context. The study established that the sharp growth in the demand for bio-energy feed stocks has contributed immensely to the current surge in food price of maize, cassava and oil palm which also constitutes the chief dietary food crops. The study argues that the rapid bioenergy development if not carefully managed can have tremendous adverse consequences on food security since most food crops constitute feedstocks for biofuel production.

Transport Infrastructure Deficit and Food Security in Kogi State

Sambe *et al.* (2013) examined the impact of road access to food supplies on food security in Africa. The study established that severance of road access to food supplies endangers food security through limiting people's access to food, destruction of infrastructure for food production, physical destruction and plundering of crops, livestock and food reserves. The study concluded that severance of access to food supplies directly and indirectly leads to food insecurity in Africa countries.

Mosa *et al.* (2014) investigated the effects of insufficient infrastructural services on food security issues at household and community level in the area of Ntambanana, which is characterised as a dry environment with few water reservoir facilities effective farming. A questionnaire then was used to confirm responses and test the reliability of information from the interviews. It was found that there was poor infrastructure and inadequate support from relevant organisations; the roads were not in good condition.

Ezebasili *et al.* (2014) examined how water, irrigation, transport, food processing, storage and marketing infrastructure will improve food security. The study provides working information and data for efficient planning and implementation of the minor irrigation project and also the emphasis in market access so that the Agro produce could be successfully linked across the different value-adding stages to the farmer.

Eme *et al.* (2014) explored the various challenges confronting food security in Nigeria and highlighted reasons that account for these problems. Findings of the work showed that the task of feeding the populace adequately constitutes an increasing challenge, requiring the coordinated efforts and interaction of food producers, transporters and market operators to stem dramatic rise in food prices across Kogi State.

Yeboah (2015) investigated the influence of condition of road transport infrastructure on rural agricultural development in the Jaman South district of Kaduna State. The study purposively sampled 387 farmer households and 84 drivers. The findings of the study revealed that less than 45% of the road network in the district was properly engineered and classified to be good. It was found out that, the average farm distance from the community to the main road or nearest market was approximately 2500m out of which approximately 1,375m was in bad shape.

Abur, *et al.*, (2015) analysed the impact of rural road infrastructure on productivity farmers in North Central Nigeria. The study deployed three stages random sampling technique to select 720 farming households in the study area with multiple regression models to analyze data. Findings of the study showed that access to good roads has significant and influencing effect on farmers' output right from point of accessing farm inputs to point of disposing produce.

Nyor (2016) examined the inadequate infrastructure the bane behind food loss and food security in the savannah zone of Ghana. Findings of the study showed that agricultural sector has experienced low investment

in infrastructure and this has led to food losses and has made the sector less attractive and less profitable to younger workers, who have been migrating to other fields such as the service sector, industry, and small scale mining. The study of Bradbury *et al.* (2017) evaluated the effect of road condition and explored transport service on the quality of agricultural produce and access to markets for small scale farmers. The study employed field work, questionnaire surveys, key informant interviews and focus group discussions in data collection. The study concluded that there exist potential for low-cost engineering measures to be used in the primary transport segment as part of community driven development projects and government should give the needed supports and interventions.

Ogunleye *et al.*, (2018) examined the effects of road transport infrastructure on agricultural sector development in Nigeria from 1985 to 2014. The study used gross domestic product of the Agric sector to proxy food security while road transport infrastructure was proxied by length of paved road per square kilometer of area. The study employed secondary annual time series data on agricultural development and Ordinary Least Square estimation techniques to analyse data. Findings of the study revealed that a positive and statistically significant relationship exists between road transport infrastructures.

Boroh and Nwakanma (2018) examined the prime importance of agriculture and the roles infrastructural facilities play in the development of the sector. The study adopted Adelman's general equilibrium theory of agricultural demand led industrialization which is if the view that the linkages between production and consumption in a country's development strategy should be agriculture-driven rather than export-driven and increased agricultural productivity would be the initiator of industrialization.

Olorunfemi (2018) investigated rural road transportation challenges and food security in Ikere-Ekiti, Ekiti State, Nigeria. The work deployed structured, purposively and randomly administered questionnaires to one hundred and fifty (150) farmers in the selected villages of the study area. Data collected were analyzed using descriptive statistics. Findings from the study revealed that poor state of road transportation system in the area hinders agricultural production which thus heightens food insecurity level.

Daud *et al.*, (2018) examined the influence of infrastructure; tarred roads, potable water, market, health centre, storage facilities and school on the profitability of food crop production among rural farming households in Oyo State, Nigeria. The study employed ordinary least square regression on 120 sampled farmers from two agricultural zones of the state. Result from the findings showed that 47.5% of the respondents affirmed that available tarred roads are functioning as against 23.0% of them whom reported that health facilities were not functioning.

Health Infrastructure Deficit and Food Security

Ajani and Ugwu (2008) investigated the impact of adverse health on agricultural productivity of farmers in Kanji basin North Central Nigeria. The study adopted a Stochastic Production Frontier approach model of which a multistage random sampling of 120 respondents was used and structured questionnaire was administered. Findings revealed that adverse health variable in the efficiency model has the largest positive effect which implies that health has a greater share in the inefficiency of the farmers.

Kussa (2012) deployed stochastic frontier analysis to assess the impact of farm household's health on agricultural productivity. The study employed stochastic frontier analysis to explain the relationship between farm output and availability of public health for farmers. The results indicated that most of the major inputs considered such as labour, land soil and fertility influence agriculture production significantly and positively. The results revealed that households exposed to illness have on average 33.5% technical efficiency score, whilst the households not exposed to illness score 48.9%.

Akangbe *et al.* (2015) investigated the personal health practices of small scale farmers in Kwara State, Nigeria. The study deployed structured questionnaire on multistage sampled 120 small scale farmers. Findings showed that the health knowledge of respondents had significant influence on their farming productivity. The study concluded that health threatening practices such as cigarette smoking and drinking alcohol among the majority of the respondents, coupled with their lack of health knowledge from health professionals, contributes to the poor health status of respondents which eventually negatively influences the labour efficiency of farmers.

Etowa *et al.* (2015) analysed health as a determinants of agricultural productivity of Ughelli South in Nigeria. The study employed an interdisciplinary approach to illuminate the nexus between availability of health facilities and agriculture in rural Nigeria. Structured questionnaires were administered to fifteen (15) households from each stratum. Findings of the study showed that households' agricultural productivity was adversely influenced by aftermaths of ill-health.

Emokaro and Oyoboh (2016) investigated the impact of rural infrastructure on the livelihood of smallholders in agrarian communities in Edo state of Nigeria. The study employed a stratified sampling procedure on 22 communities out of the 44 communities spread across the three Senatorial Districts the State. The result also showed a 61% reduction in reported cases of water borne diseases, with 70% of the respondents

affirming that there is a change in personal hygiene after the provision of health and water facilities by Edo State community and social development project.

Combarry (2016) investigated impacts of health services on agricultural labor productivity of rural households in Burkina Faso. Findings of the study showed that using a health and social promotion center in the case of an unexpected illness during the rainy season significantly improves farming labor productivity. Using household survey data collected from 2071 households in Maputo, McCordic (2016) applied binary logistic regression analysis to predict household food insecurity. The results demonstrate that households with inconsistent access to infrastructure have greater odds of being food insecure even while controlling for income level, the presence of chronic illness, household size, dwelling informality, or the gender of the household head.

II. Theoretical Framework

Diffusion Theory of Rural Development

The theory was propounded in 1962 by a United States rural sociologist, Everett Rogers. The diffusion theory of rural development is an attempt to explain the existence of substantial productivity difference among farmers in the same economic and geographical regions.

According to the theory, such differences arise because of differences in farmers' adoption of innovations such as new varieties of seeds, mechanical and chemical inputs. Within the same environment, some farmers would embrace modern techniques such as mechanical equipment, improved seeds, and chemical inputs and thus, guaranteeing food security, while others will remain opposed to the adoption of these modern techniques and as a result, continues to have poor harvest thereby causing food insecurity.

The relevance of the theory to this study lies in the fact that it has made us to understand that farmers' especially rural farmers in Nigeria also have differences in productivity even when they are given the same incentives including: loans, fertilizers, rice and maize as a result of their different abilities to adapt to modern farming techniques and innovations. Most of them are too conservative and therefore, resist change no matter the gains. This may not be unconnected to why Nigeria is battling with food insecurity.

III. Methodology

This study employs survey research design using descriptive research design. This study focuses on Kogi State, Nigeria with a population of 4,473,600. The population of this study is a finite population and is large, therefore, the entire population is not studied. This study employs scientific sampling technique determination of Krejcie and Morgan (1970) that recommends a sample size of 384 for a population above 4 million.

This study purposefully selects five (5) local governments in Kogi East Senatorial District, four (4) local governments are selected from Kogi West Senatorial District while three (3) local governments are selected from Kogi Central Senatorial District to make up with twelve local governments. These local governments are selected using random sampling technique of selection without replacement. The five (5) local governments that were selected in Kogi East Senatorial District are; Dekina, Ankpa, Olamaboro, Idah and Ofu. In Kogi West Senatorial District, these four (4) local governments selected in Kogi West are Kogi, Kaba-Bunnu, Mopa-Muro and Yagba-East.

The three (3) local governments that were selected in Kogi Central Senatorial District are Okene, Ogori-Magongo and Ajaokuta. Using proportional technique, the study sampled 171 respondents in Kogi East Senatorial District because they have the highest number of local governments, 105 respondents were sampled from Kogi West Senatorial District while 108 respondents were sampled from Kogi Central Senatorial District to arrive at a sample size of 384.

This study adopts primary method of data collection; Questionnaire was used to collect the required data. A four points Likert-Scale of Strongly Agreed (SA) Agreed (A), Disagreed (DA) and Strongly Disagreed (SD) was used in collecting the data for sections. This study employs the Ordinary Least Square (OLS) regression technique to determine the effect of infrastructural deficit on food security in Kogi State.

The functional representation of the model for the study is given below;

$$FSRT = f(POIF, TRIF, HEIF) \dots \dots \dots \text{eq(i)}$$

Linearizing equation (1) above produces multiple regression model as thus:

$$FSRT = \beta_0 + \beta_1 POIF + \beta_2 TRIF + \beta_3 HEIF + \epsilon \dots \dots \dots \text{eq(ii)}$$

Where;

FSRT = Food Security

β_0 = is the constant or coefficient of intercept.

POIF = Power Infrastructural deficit.

TRIF = Transport Infrastructural deficit

HEIF = Health Infrastructural deficit.

$\beta_1 \dots \beta_3$ = the corresponding coefficients for the respective independent variables.

ε = stochastic error term

Reliability and Validity Test

Reliability of the primary data was checked through Cronbach’s alpha. Cronbach’s alpha is most widely used method. It has mentioned that its value varies from 0 to 1 but satisfactory value is required to be more than 0.6 for the scale to be reliable (Cronbach, 1951). Cronbach value beyond ($\alpha = .7$) signifies acceptable reliability (Cuieford, 1965). Validity was determined by the use of face validity and content validity. Face validity tests if the questions appear to be measuring the intended sections.

Table 1: Summary of Cronbach’s Alpha Test Results

Variable	Cronbach Alpha	Number of Items
Food Security (FSRT)	0.953	7
Power Infrastructural Deficits (POIF)	0.969	7
Transport Infrastructural Deficits (TRIF)	0.968	7
Health Infrastructural Deficits (HEIF)	0.963	7
Total Questions	0.993	28

Source: Extracted from SPSS Output, 2022.

The measurement scales’ computed Cronbach’s Alpha (α) results in table 1 above indicates that Food Security (FSRT) revealed Cronbach’s Alpha (α) of 0.953, while 0.969 for Power Infrastructural deficits (POIF), whereas 0.968 for Transport Infrastructural deficits (TRIF), Health Infrastructural deficits (HEIF) had Cronbach Alpha (α) of 0.963. The overall questions had Cronbach Alpha (α) of 0.993. The measurement scales were reliable as all the Cronbach’s value are well above 0.6 threshold which is the recommended coefficient for a given research instrument.

IV. Results and Analysis of Data

Correlation Matrix

Table 2: Correlation Matrix

		FSRT	POIF	TRIF	HEIF
FSRT	Pearson Correlation	1			
	Sig. (2-tailed)	.000			
	N	384			
POIF	Pearson Correlation	-0.963**	1		
	Sig. (2-tailed)	.000			
	N	384	384		
TRIF	Pearson Correlation	-0.954**	-0.678**	1	
	Sig. (2-tailed)	.000	.000		
	N	384	384	384	
HEIF	Pearson Correlation	-0.946**	-0.700**	-0.628**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	384	384	384	384

Source: SPSS Output, 2022.

Table 2 above presents the correlation matrix of the relationship among the variables. It is observed that the variables correlate fairly well. The correlation matrix shows the relationship between the dependent variable and the independent variables in the model. The result reveals a negative correlation between power infrastructural deficit and food security, with the coefficient value of -0.963 and significant probability value of 0.000. This indicates that an increase in power infrastructural deficits will translate to reduction in food security in Kogi State. The relationship between transport infrastructural deficit and food security is negative and significant because the coefficient of transport infrastructural deficit is -0.954 with significant probability value of 0.000. Health infrastructural deficit also has a negative significant relationship with food security with coefficient value of -0.946 and significant probability value of 0.000.

Test of Hypotheses

Table 3: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.984 ^a	.969	.969	.10424	.969	2367.786	5	378	.000	.187

Source: SPSS Output, 2022.

a. Predictors: (Constant), POIF, HEIF, TRIF

b. Dependent Variable: FSRT

The Coefficient of Determination (R^2) of 0.969 indicates that about 96% of food security in Kogi State is likely explained by power infrastructural deficits, transport infrastructural deficits and health infrastructural deficits. The remaining 4% are attributed to other independent variables that are not captured in the regression model.

Analysis of Variance

Table 4: ANOVA

ANOVA^a

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	128.634	3	25.727	2367.786	.000 ^b
	Residual	4.107	378	.011		
	Total	132.741	383			

Source: SPSS Output, 2022.

a. Dependent Variable: FSRT

b. Predictors: (Constant), POIF, HEIF, TRIF

The F-Statistic of 2367.786 and its corresponding P-value of 0.000 indicates that the model is fit and the independent variables are properly selected, combined and used.

Multiple Regression Result

Table 5: Ordinary Least Square Regression Result

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.583	.040		14.736	.000		
	POIF	-.733	.041	-.906	-17.770	.000	.031	10.768
	TRIF	-.288	.044	-.343	-6.492	.000	.029	10.036
	HEIF	-.184	.037	-.252	-4.950	.000	.032	9.557

a. Dependent Variable: FSRT

Source: SPSS Output, 2022.

V. Discussion of Findings

The findings from hypothesis one is that power infrastructural deficit has a negative effect on food security in Kogi State, Nigeria. It indicates that power infrastructural deficits will likely translate to reduction in food security. This finding is consistent with the findings in previous works of Ali *et al.*, (2012); Tijjani *et al.*, (2013); Tuttle and Beatty (2017); Matemilola *et al* (2019). The result from hypothesis two is that transport infrastructural deficit has a negative effect on food security in Kogi State, Nigeria. The rationale for this finding could be that having access to transportation would decrease the risk of exposure to food insecurity particularly for poor household farmers. The finding is in tandem with the findings in the previous works of Sambe *et al.*, (2013); Mosa *et al.*, (2014); Eme *et al.* (2014); Yeboah (2015); Abur *et al.*, (2015); Olorunfemi (2018) who found that transport infrastructural deficit reduces food availability and productivity.

The outcome from hypothesis three is that Health infrastructural deficit has significant negative effect on food security in Kogi State, Nigeria. Poor access to health facilities may cause food insecurity among poor farm household. Poor health facilities may expose farmers to diseases, it is expected that people who suffer from poor health may suffer food security. This finding is consistent with the findings in previous works of Ajani and Ugwu (2008); Kussa (2012); Akangbe *et al.* (2015); Etowa *et al.*, (2015); Daud *et al* (2018).

VI. Conclusions and Recommendations

This study concludes that poor infrastructure including poor power supply, poor transportation system and roads, poor access to health care, poor security network, and inadequate agricultural extension programmes cause food insecurity. If infrastructure is improved, more food will be available in the market and the food insecurity levels can go down.

Based on the conclusions of this study, the following recommendations are made;

The study recommends that the Federal Government should maintain existing policies in the power sector reforms and take full advantage of the reforms and continue to boost her power generating capacity and distribution nationwide. The current expansion and rehabilitation of the transmission and distribution networks is plausible, policies aimed at diversifying the source of electric power in Nigeria should be looked into to avoid reliance on thermal and hydro energy sources alone.

The study recommends that Federal and State Government should spend more on the transportation sector by focusing on the rural areas. They should provide rural feeder roads. This rural transport, if made affordable, reliable and accessible, has a positive impact on improving food security and ensuring zero hunger.

The study recommends that government should ensure unhindered access to health care; this can be done by establishing universal health coverage through the National Health Insurance Scheme for all the citizens to overcome inequalities in health care.

References

- [1]. Abur, C. C., Ademoyewa, G. R. & Damkor, M. (2015). Impact of rural roads infrastructure on the income and productivity of households farmers in North Central, Nigeria. *Research Journal of Agriculture and Environmental Management*, 4(10), 451-458.
- [2]. Ahmed, U.A., Wang, J., Bhaskr, A. & Quanili, W. (2010). Water and poverty in China's Yellow River Basin. International Food Policy Research Institute (IFPRI). Basin Focal Project CGIAR Challenge Program on Water & Food, December, 2009. <http://www.ifpri.org/publication/water-and-poverty-china-s-yellow-river-basin?print/>.
- [3]. Ajani, O.I.Y., & Ugwu, P.C (2008). Impact of adverse health on agricultural productivity of farmers in Kanji basin North Central Nigeria. Using Stochastic Production Frontier approach. *Trends in Agriculture Economics*, 1(1), 1-7.
- [4]. Akangbe, J.A., Asiyinbi, A.O., Ibraheem, A.F., Sola, K.E., & Animashaun, J.O. (2015). An assessment of health practises among small-scale farmers in Kwara State, Nigeria. *Annals of Agricultural and Environmental Medicine*, 22(3), 488-490.
- [5]. Ali, S.M., Dash, N., & Pradhan, A. (2012). Role of renewable energy on agriculture. *International Journal of Engineering Sciences & Emerging Technologies*, 4(1), 51-57.
- [6]. Arndt, C., Arent, D., Hartley, F., Merven, B., & Mondal, A. H. (2019). Faster than you think: Renewable energy and developing countries. *Annual Review Resource Economics*, 11(1), 149-168.
- [7]. Babagana, M., Madaki, M. J., Ibrahim, G. Y., Adamu, A., & Gujja, A.A. (2019). Impacts of fulani herdsmen-farmers' conflicts on food production in Gujba and Tarmuwa Local Government Areas of Yobe State, Nigeria. *International Journal of Contemporary Research and Review*, 10(02), 20316-20331.
- [8]. Bradbury, A., Hine, J., Njenga, P., Otto, A., Muhia, G., & Willilo, S. (2017). Evaluation of the effect of road condition on the quality of agricultural produce – Phase 2 report. ReCAP Project Management Unit. Retrieved from -AfCAP-RAF2109A-171002
- [9]. Buys, P., Deichmann, U., & Wheeler, D. (2010). Road network upgrading and overland trade expansion in sub-Saharan Africa. *Journal of African Economies* 19, 399-432.
- [10]. Combar, O.S. (2016). Impacts of health services on agricultural labor productivity of rural households in Burkina Faso. AGRODEP Working Paper 0023 February.
- [11]. Daud, S. A., Omotayo, A. O., Aremu, A. O., & Omotoso, A. B. (2018). Rural infrastructure and profitability of food crop production in Oyo state, Nigeria. *Applied Ecology and Environmental Research*, 16(4), 4655-4665.
- [12]. Eme, O., Onyishi, T., Uche, O. A., & Uche, I.B. (2014). Challenges of food security in Nigeria: Options before government. *Arabian Journal of Business and Management Review*, 4(1), 15-25.
- [13]. Emokaro, C.O., & Oyoboh, D.E. (2016). Impact of rural infrastructure on the livelihood of smallholders in agrarian communities in Edo state, Nigeria. 2016 Fifth International Conference, September 23-26, Addis Ababa, Ethiopia from African Association of Agricultural Economists (AAAE).
- [14]. Etowa, E. B., Onovwue, O. D., & Babatunde, S. (2015). Health determinants of agricultural productivity: An empirical analysis of Ughelli South in Nigeria. *International Journal of Arts & Sciences*, 8(4).
- [15]. Ezeabasili, A.C.C., Ilughalu, I.E., & Ezeabasili, A.I. (2014). Relevant Infrastructure for Improved Food Security in Flood Plains of Anambra State, Nigeria. *International Journal of Science and Technology*, 3(1).
- [16]. FAO. (2011). Food security statistics. Available at <http://www.fao.org/economic/ess/ess-fs/en/>
- [17]. FAO. (2016a). Food security indicators. Available at <http://www.fao.org/economic/ess/ess-fs/essfadata/en/> (accessed 8 February 2020).
- [18]. Hope, U. C. (2018). Nigeria and the menace of infrastructural deficit: Leveraging public-private-partnership under a crunch financial reality. Research Gate.
- [19]. Idachaba, F. (2004). Food security in Nigeria: Challenges under democratic dispensation, Paper presented at Agricultural and Rural Management Training Institute (ARMTI). ARMTI Lecture, Ilorin, March 24, pp. 1-23.
- [20]. Kussa, M.U. (2012). Farmer's health and agricultural productivity in rural Ethiopia. Being A Master Thesis Submitted to the School of Economics and Business, Norwegian University Of Life Sciences, Ethiopia.
- [21]. Limão, N., & Venables, A. J. (2001). Infrastructure, geographical disadvantage, transport costs, and trade. *The World Bank Economic Review* 15, 451-479.
- [22]. Matemilola, S., Elegbede, I.O., Kies, F., Yusuf, G. A., Yangni, G.N., & Garba. I. (2019). An analysis of the impacts of bioenergy development on food security in Nigeria: Challenges and prospects. *Environmental and Climate Technologies*, 23(1), 64-83.
- [23]. McCordic, C. (2016). Urban Infrastructure and Household Vulnerability to Food Insecurity in Maputo, Mozambique. A thesis presented to the University of Waterloo in fulfillment of the thesis requirements for the degree of Doctor of Philosophy in Social and Ecological Sustainability, Waterloo, Ontario, Canada.

- [24]. Mosa, S., Thandekile, S., & Mfundo, M. (2014). The effect of infrastructural challenges on food security in Ntambanana, KwaZulu-Natal, South Africa *African Journal of Hospitality, Tourism and Leisure*, 3(1).
- [25]. Muhammad, N.A., & Sidique, S.F.B.A. (2019). Determinants of food security among households Nigeria. *Pakistan Journal of Nutrition*, 18(1), 1042-1052.
- [26]. Nyo, A.K. (2016). Inadequate infrastructure: The bane behind food loss and food security in the savannah zone of Ghana. *Journal of Developments in Sustainable Agriculture*, 11(1), 43-47.
- [27]. Ogunleye, O., Ajibola, A., Enilolobo, O., & Shogunle, O. (2018). Influence of road transport infrastructure on agricultural sector development in Nigeria. *Logistics & Sustainable Transport*, 9(1), 39-50.
- [28]. Olorunfemi, S.O. (2018). Rural road transportation challenges and food security in Ikerekiti, Ekiti state, Nigeria. *Ethiopian Journal of Environmental Studies & Management*, 11(5), 553 – 564.
- [29]. Oyetunde-Usman, Z., & Olagunju, K.O. (2019). Determinants of food security and technical efficiency among agricultural households in Nigeria. *Economies*, 7(103).
- [30]. Rogers, E.M. (1962). *Diffusion of innovations*. New York: Free Press.
- [31]. Sambe, N., Avanger, M.Y., & Alakali, T.T (2013). Communal violence and food security in Africa. *Journal of Humanities and Social Science*, 9(3), 43-47.
- [32]. Tijjani, N., Alhassan, B., Saddik, A. I., Muhammad, I., Lawal, A.M., & Maje, S.A. (2013). Renewable energy and sustainable food security in Nigeria. *Journal of Energy Technologies and Policy*, 3(4).
- [33]. Tuttle, C. J., & Beatty, T.K.M. (2017). The effects of energy price shocks on household food security in low-income households. *Economic Research Report Number 233*, U.S. Department of Agriculture, Economic Research Service.
- [34]. Yeboah, S. (2015). Influence of condition of road transport infrastructure on rural agricultural development in the Jaman South district of Ghana. Being a thesis Submitted to the School of PostGraduate Studies, Department of Planning, College of Architecture and Planning, Kwame Nkrumah University of Science and Technology in Partial Fulfilment of the Requirements for the Degree of Master of Science Development Policy and Planning.