

## RURAL INFRASTRUCTURE AND LIVELIHOOD CHOICES AMONG FARMING HOUSEHOLDS IN SOUTHWESTERN NIGERIA

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### Abstract

*The study examined the effect of rural infrastructure on livelihood choice among farming households in Southwestern Nigeria (SWN). A multistage sampling procedure was used to collect primary data from 562 selected respondents on their socio-economic characteristics, Access to Rural Infrastructure (ARI) and livelihood choices [Cropping+Non-farm (CN), Cropping+Non-PoultryLivestock+Non-farm (CNPLN), Cropping+PoultryLivestock+Non-farm (CPLN) and Cropping+Fisheries+Non-farm (CFN)]. Data were analysed using descriptive statistics and Multinomial Logit Regression. The study revealed that about 70% of the respondents were not more than 54 years old, male (65.1%) and married (70.1%). More households had high access to infrastructure (52.8%). Adoption of livelihood choice was 35.8%, 41.6%, 12.2% and 10.4% for CN, CNPLN, CPLN and CFN, respectively. Age, age<sup>2</sup>, sex, household size, household income, Dependency Ratio (DPR), primary education, secondary education and land ownership explained CN, while CPLN was explained by age, secondary education, household income, access to credit and ARI. Age, tertiary education, land ownership, access to credit and ARI explained CFN. The study concluded that CPLN and CFN livelihood choices required adequate access to infrastructure. It is recommended that adequate provision of infrastructure should be ensured to encourage more farmers to go into these enterprises and thereby increase their productivity, level of income and food security.*

**Key Words:** Rural infrastructure, Livelihood choice, Farming households

### Introduction

The rural welfare literature accentuates rural livelihoods and the choices made by rural households in their bid to insure the welfare of their members. A livelihood can be explained as a way of earning money that enables people to live. A livelihood is achieved by employing

different types of capital/assets in income generating activities whose participation is dictated by institutional and social interactions. Livelihoods concept has gone a long way in explaining the economic activities that households engage in and the significance of capital/assets in deciding the ability to

take up these activities (Scoones *et al.*, 2018; Loison, 2015 and Niehof, 2004). Several studies have revealed that rural households engage in multiple economic activities to sustain livelihoods (Abebe *et al.*, 2021; Gebbisa and Mulatu (2020); Davis *et al.*, 2017; Nmeragini *et al.*, 2019; Oni and Fashogbon, 2013; Mutenje *et al.*, 2010).

Infrastructure is a public asset and a form of capital. The infrastructure available and which households can access in a community determines largely the livelihood activities which they can engage in. This enhances their potentials to diversify and raise income and consequently improve household welfare. Despite the tremendous impact of rural dwellers to the economic development of Nigeria, the sector has experienced retarded growth and development with a resultant high level of poverty for many year due to the absence and/or inadequate infrastructure (Olanrele, 2020; Aderogba and Adegbeye, 2019; and Osunmakinde, 2019).

Infrastructures are public goods and members of the community have equal rights to benefit from their services without necessarily paying for access to them because they are usually supplied by the government and private organizations. Thus, the provision of infrastructure closes the gap between the poor and the better-off in a community. As stated in the World Bank 1994 report, access to rural infrastructure aids rural dwellers in their production, processing and marketing activities and enhances the nature of rural life generally. A lot of other studies show that adequate infrastructure access reduces production cost thus increasing their profit levels, other things remaining

constant (Saheed and Obianuju, 2021; Olorunfemi, 2020; Wu *et al.*, 2019; Adeoye *et al.*, 2011).

The high prevalence of poverty among rural households is as a result of limited access to infrastructure (Emokaro and Oyoboh, 2016). Intriguingly, the economic activities of these households are crucial to the economy of the country, particularly through their agricultural activities which form the major share of the country's export earnings. In spite of this, the rural sector continues to experience stunted growth and development over the years primarily due to inadequate and sometimes no access to infrastructure. For Nigeria, empirically robust evidence on the connection between livelihoods and infrastructure is vital for economic growth and development, especially in the rural areas. The availability of infrastructure usually has positive impact on poverty reduction by aiding economic development (Ekeocha *et al.*, 2021; Olanrele, 2020; Daud *et al.*, 2018; World Bank, 1994).

In view of the importance of infrastructure in economic development, it would be interesting to examine how it impacts livelihood choice among rural farming households in SWN. The study strove to answer the following research questions – what are the livelihood choices of rural farming households in SWN? How developed is the study area? How does infrastructure access affect livelihood choice among rural farming households in SWN? The study aimed at closing the gap in existing literature by providing empirical evidence on the effect of access to rural infrastructure on livelihood choices.

## Research Methodology

### Study Area

The study was carried out in SWN, a geo-political zone in Nigeria. It consists of Ondo, Oyo, Ekiti, Ogun, Lagos and Osun States (Fig. 1). It lies between latitude  $6^{\circ} 21' 1''$  and  $8^{\circ} 37' 1''$  North and longitude  $20^{\circ} 31' 1''$  and  $6^{\circ} 00' 1''$  East (Faleyimu *et al.*, 2010). It shares boundary with Kogi and

Kwara states to the north, Delta and Edo states to the east, Republic of Benin to the west and Atlantic Ocean to the south. SWN has an expansive land area of about  $77,818\text{km}^2$  with an estimated population of around 27, 581, 992 people (NPC, 2006). Livelihood activities in SWN are diverse in nature.

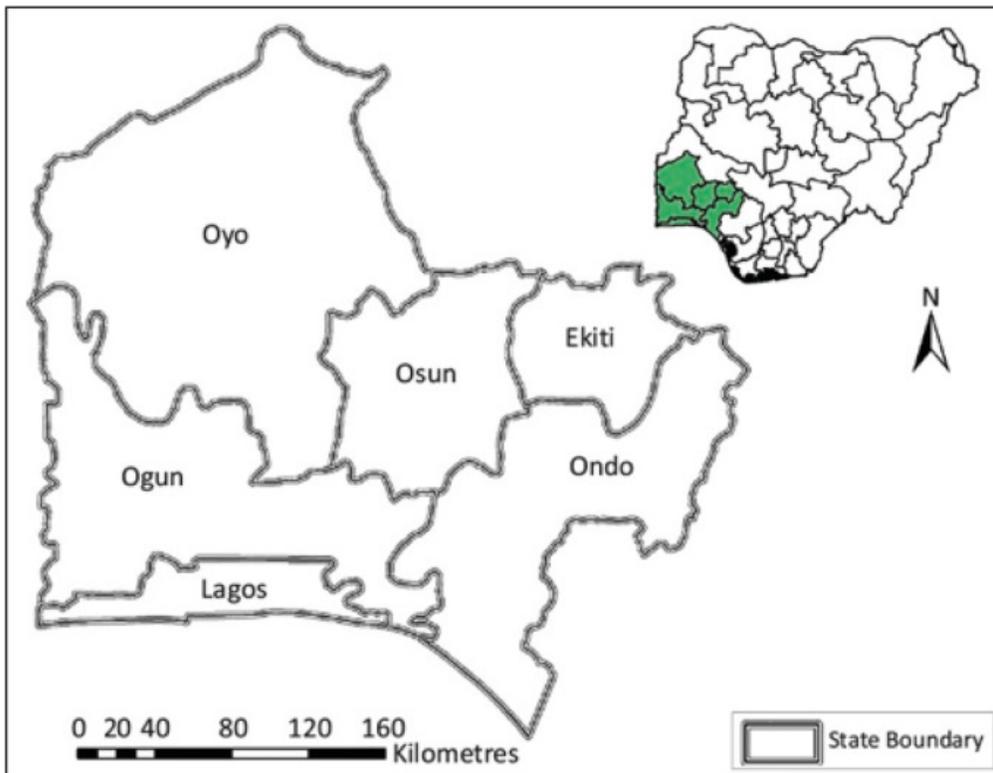


Fig 1: Map of Southwestern Nigeria

### Sampling Technique and Data Collection

The study obtained primary data from well-structured questionnaires in the study area using a multistage sampling procedure. The first stage involved the selection of two from the six states randomly SWN. In the second stage, two rural Local Government Areas (LGAs) each from the six senatorial districts of the

two states were randomly selected, making a total number of twelve LGAs. In the third stage, simple random sampling technique was employed to select twenty-four villages from the twelve LGAs, proportionate to size. Using a proportionate to size sampling, a total number of 562 households were selected randomly from the 24 villages in the fourth stage.

**Analytical Techniques**

(i) **Descriptive statistics:** frequencies and percentages.

(ii) **Construction of Infrastructural Index INF:** INF was constructed for all the types of infrastructure (Osunmakinde et al., 2022; Africa Development Bank, 2020 and Bulus and Adefila, 2014) to determine the extent of infrastructural development of the communities. Transportation cost to the nearest assessed infrastructure was used because most of the respondents could not give precise distance to the infrastructure (Osunmakinde et al., 2022; Olorunfemi, 2020). The INF was obtained as presented in the equations below:

$$AC_i = \frac{\sum_{i=1}^n IDC_i}{n} \dots\dots\dots (1)$$

$$TC_i = \sum_{i=1}^n AC_i \dots\dots\dots (2)$$

$$ATC_i = \frac{TC_i}{N} \dots\dots\dots (3)$$

$$W_i = \frac{AC_i}{ATC_i} \dots\dots\dots (4)$$

$$INF = \sum_{i=1}^n W_i \dots\dots\dots (5)$$

Where:  
*IDC<sub>i</sub>* = transportation cost of a respondent to an infrastructure in each community (N);  
*AC<sub>i</sub>* = average cost of transportation in each community to an infrastructure (N);  
*TC* = total cost of transportation to an infrastructure across communities (N);  
*ATC* = average cost of transportation to an infrastructure across communities (N);  
*W<sub>i</sub>* = weight of average transportation cost to an infrastructure in each community;  
*INF* = infrastructural index;  
*N* = number of communities;  
*n* = number of respondents in each community.

The addition of the individual access cost (*TC<sub>i</sub>*) to the infrastructure gave the cost of transportation of individual respondents (*IDC<sub>i</sub>*) in each of the

communities. The *TC<sub>i</sub>* was obtained by summing the *AC<sub>i</sub>*. The selection of these infrastructure elements was based on their relative homogeneity across the selected communities. The average total cost (*ATC*) of accessing each infrastructure across these communities was calculated and divided by the average costs (*AC<sub>i</sub>*) of getting to a particular infrastructure facility in each of the communities to give *W<sub>i</sub>* which was added together to get the INF. INF indicates the level of access to infrastructure and how developed a community is. The lower the value of INF, the more the access to infrastructure and hence, the more developed the community (Osunmakinde et al., 2022; Manggat et al., 2018 and Bulus and Adefila, 2014). The communities were grouped into developed and underdeveloped by finding the average infrastructural index. Communities with values more than the average are underdeveloped and less than average are developed.

(iii) **Multinomial Logit Model:** MNL was used to determine the effects of access to rural infrastructure on livelihood choices of farming households since livelihood choice is a polytomous choice variable (Greene, 2003). The identified livelihood choices are: Cropping and Non-farm activities (CN); Cropping, Non-Poultry Livestock and Non-farm activities (CNPLN); Cropping, Poultry Livestock and Non-farm activities (CPLN); Cropping, Fishing and Non-farm activities (CFN). This study assumed that all the livelihood choices were mutually exclusive (Hirsi et al., 2021; Gebbisa and Mulatu, 2020; Dinku, 2018). Therefore, a household has made an optimal allocation of its resources by making a livelihood choice that maximises its utility. In this way, the *ith* household could be modelled

as maximizing utility by selecting the  $y^{th}$  livelihood choice out of  $Y$  discrete choices. This is expressed as:

$$Max_y = E(U_{iy}) = f_y(x_i) + e_{iy}; y = 0, \dots, Y \dots\dots\dots(6)$$

Generally, for an outcome variable with  $Y$  categories, let the  $y^{th}$  livelihood choice that the  $i^{th}$  household picks in order to maximize its utility assume 1 and if contrary 0. Since not all the model parameters were identified, the model had to be normalised by setting any of its sets of parameters to zero, thereby eliminating elements of indeterminacy. To this end, a constraint was imposed on the model by setting the parameters of the second choice of livelihood strategy (i.e. CNPLN) to be all zero. Thus,  $\beta_{12} = \beta_{22} = \beta_{nk} = 0$  which was used as the base category against which the other categories were compared. Choosing a particular livelihood strategy is modelled as a function of some socioeconomic characteristics:

$$D_{it} = f(X_i) \dots\dots\dots (7)$$

Where,  $D_{it}$  assumes a value from 1, 2, .....,  $J$  if a household chooses a specific livelihood.

The explanatory variables are:

- $X_1$  = Age of Household head (years)
- $X_2$  = Age Square of Household head

- $X_3$  = Sex (1 = male; 0 =female)
- $X_4$  = Marital Status
- $X_5$  = Household Size
- $X_6$  = Dependency Ratio
- $X_7$  = Primary Education (1if Yes; 0 otherwise);
- $X_8$  = Secondary Education (1if Yes; 0 otherwise);
- $X_9$  = Tertiary Education (1if Yes; 0 otherwise);
- $X_{10}$  = Household Income (₦)
- $X_{11}$  = Land Ownership (1if Yes; 0 otherwise)
- $X_{12}$  = Farming Experience (Years)
- $X_{13}$  = Credit Access (1if Yes; 0 otherwise)
- $X_{14}$  = Access to Rural Infrastructure

**Result and Discussion**

The socio-economic characteristics of respondents are presented in table 1. As shown in the table, about 70% of the respondents were between 25 and 54 years old, meaning that most of them were economically active. More households were male headed (65.1%), married (70.1%) and most of the households (50.7%) had between five and eight members.

Table 1: Distribution of Socio-Economic Characteristics of Respondents

<b>Variables</b>	<b>Frequency</b>	<b>Percentage</b>
<b>Age(in yrs)</b>		
25 – 34	64	11.4
35 – 44	176	31.3
45 – 54	153	27.2
55 – 64	96	17.1
>=65	73	13.0
<b>Gender</b>		
Male	366	65.1
Female	196	34.9
<b>Marital Status</b>		
Married	394	70.1
Widow/Widower	76	13.5
Divorced/Separated	92	16.4
<b>Household Size</b>		
1-4	167	29.7
5-8	285	50.7
9-12	78	13.9
>12	32	5.7
<b>Years of Schooling</b>		
0	118	21.0
1-6	209	37.1
7-12	183	32.6
>12	52	9.3
<b>Farming Experience (Years)</b>		
<=10	165	29.4
11 – 20	328	58.4
>20	69	12.2
<b>Land ownership</b>		
Yes	398	70.8
No	164	29.2
<b>Credit Access</b>		
Yes	183	32.6
No	379	67.4

In order to increase the income of households and improve welfare of their members, majority of them (64.2%) diversified into other agricultural enterprises apart from crop farming. The various livelihood choices of the households are presented in table 2 and these are:

- Y1 = cropping and non-farm activities (CN);
- Y2 = cropping, non-poultry livestock and non-farm (CNPLN);
- Y3 = cropping, poultry livestock and non-farm (CPLN);
- Y4 = cropping, fishing and non-farm (CFN).

As shown in Table 2, most (41.6%) of the respondents derived their livelihood from CNPLN while only 10.4% of the respondents diversified into fishing CFN. About 12.2% of the respondents derived

their livelihood from CPLN and the remaining 35.8% were involved in CN. All the households were involved agriculture.

Table 2: Livelihood Choices of Respondents

Livelihood Portfolio	Crops Grown	Non-farm Activities	Diversification	Percentage
CN	Yams, maize, cassava, cocoyam, cocoa, vegetables and fruits	Civil service, Private employment, Trading, artisanal	None	35.8
CNPLN	Same as CN	Same as CN	Sheep, goat, cattle, pigs	41.6
CPLN	Same as CN	Same as CN	chicken, quail, duck	12.2
CFN	Same as CN	Same as CN	Fishing	10.4

Table 3 shows that of 25% (9) of the villages were highly developed with INF of not more than 0.55 while 27.8% (10) of the villages were moderately developed with INF that was greater than 0.55 and not more than 1.0. Furthermore, 12 villages were moderately underdeveloped

with INF of not more than 1.5 and the remaining 5 villages with INF that was more than 1.5 were highly underdeveloped. In all, over half (52.8%) of the villages were developed while the remaining 47.2% were underdeveloped.

Table 3: Distribution of Villages by Degree of Infrastructure Development Index

Range of Index No.	No. of Villages	Percentages	Development Status
≤ 0.55	9	25.0	Highly Developed
>0.55 – 1.0	10	27.8	Moderately Developed
<b>Subtotal</b>	<b>19</b>	<b>52.8</b>	
>1 – 1.5	12	33.3	Moderately Underdeveloped
>1.5	5	13.9	Highly Underdeveloped
<b>Subtotal</b>	<b>17</b>	<b>47.2</b>	
<b>Total</b>	<b>36</b>	<b>100</b>	

The distribution of the livelihood choices of households in relation to the development status of the villages they reside in is presented in table 4. The results show that the choice of CN was not really influenced by level of infrastructural development. As revealed in the table, 86 (45.7%) and 102 (54.3%) households in the developed and

underdeveloped areas respectively chose CN. There was not much difference in the number of households engaged in CN in the developed and underdeveloped villages. With respect to the choice of CNPLN, a similar trend was observed as 110 (51.4%) households in the developed villages were engaged in this livelihood

type and 104 (48.6%) households in the underdeveloped villages.

The level of infrastructural development influenced greatly the choices of CPLN and CFN. For CPLN, 64 (76.2%) households in the developed villages were engaged in the livelihood

type compared to only 20 (23.8%) in the underdeveloped villages while in the case of the CFN, 50 (65.8%) households out of the 76 that chose CFN were in the developed villages while just 26 (34.2%) were in the underdeveloped ones.

Table 4: Distribution of Households’ Livelihood Choice in Relation to the Level of Development of their Villages

Development Status	Livelihood Choice				Total
	CN	CNPLN	CPLN	CFN	
Developed	86 (45.7)	110 (51.4)	64 (76.2)	50 (65.8)	310 (55.2)
Underdeveloped	102 (54.3)	104 (48.6)	20 (23.8)	26 (34.2)	252 (44.8)
<b>Total</b>	188 (100)	214 (100)	84 (100)	76 (100)	562 (100)

(Figures in parenthesis are the percentages)

The result of the MNL model and the marginal effects is as presented in table 5. CNPLN was the base category. The log likelihood estimate is -498.74 and its chi-square value is statistically significant at  $p < 0.01$ , meaning that the model fits the data.

**CN:** age of household head was found to be initially positively related choice of CN but they advanced in age, the relationship became negative relative to the base category. The likelihood of choosing CN increased by 11.9% and later decreased by 9.5% as the household head got older. This is in consonance with the findings of Osunmakinde (2019) and Dinku (2018). The likelihood of female headed households choosing CN increased by 28%. This is in agreement with the findings of Gani *et al.* (2019) but contrary to those of Zeleke (2021) and Temesgen *et al.* (2016). Household size and income

were positively significant meaning that an increase in these variables increased the likelihood of the household to choose CN strategy by 23.5% and 36.2% relative to the base category. DPR was also positively significant at 5%. An increase in the number of dependants resulted in a 46.7% likelihood of a household to choose CN. This result is in consensus with the findings of Zeleke (2021); Gani *et al.* (2019) and Temesgen *et al.*, (2016). Household heads with only primary education were 37.1% more likely to adopt the CN relative to the base category. This is in consensus with the findings of Zeleke (2021) and Temesgen *et al.* (2016). Secondary education decreased the likelihood of choosing CN by 44% while land ownership increased the likelihood of choosing it by 19.7%. This is in agreement with the findings of Abebe *et al.* (2021). The variable ARI was not significant.

Table 5: Determinants of Households’ Livelihood Choices and Marginal Effects Estimates

Variable	CN		CPLN		CFN	
	Coefficient	dy/dx	Coefficient	dy/dx	Coefficient	dy/dx
Age	0.4519*	0.119	-0.1053***	-0.304	-0.0560**	-0.105
Age squared	-0.3877**	-0.095	0.0007	0.062	0.0003	0.033
Sex	0.9173**	0.281	-0.4586	-0.315	0.2405	0.034
Marital status	-0.1841	0.006	0.2418	0.152	0.0027	-0.387
Household size	0.1176***	0.235	0.2363	-0.450	-0.3862	-0.017
DPR	0.2021**	0.467	0.6170	-0.487	0.1633	0.116
Primary education	0.5795*	-0.371	0.1529	0.203	1.2114	-0.163
Secondary education	-1.1258***	0.51	-1.3414***	-0.622	0.7325	0.212
Tertiary education	0.0759	0.128	-0.0337	0.022	2.7251***	-0.311
Household Income	0.0481**	0.362	-0.5701*	-0.183	-9.3300	-0.001
Land ownership	0.8051**	0.197	-0.5973	-0.021	-1.3778*	-0.077
Farming experience	0.0276	0.225	0.0241	0.162	0.0117	-0.749
Credit Access	0.1308	-0.874	0.7988***	0.504	0.0271**	0.370
ARI	-0.3343	0.105	-0.8637***	-0.429	0.0432**	0.324
Constant	1.7048***		2.2471***		3.9541*	
Observations	562		562		562	
Pseudo R <sup>2</sup>	0.6325					
Log likelihood	-498.74					

\*\*\*, \*\*, \* indicate 1%, 5%, 10% levels of significance respectively

**CPLN:** age of the household head decreased the choice of CPLN by 30.4%, agreeing with the findings of Gebbisa and Mulatu (2020). Secondary education increased the likelihood of choosing CPLN by 62.2%.

This is in agreement with the findings of Abebe *et al.* (2021); Maniriho and Nilsson (2018) and Oluwatayo (2009). The likelihood of choosing CPLN was increased by 18.3% and 50.4% with increases in household income and access to credit respectively. This is in consensus with the findings of Osunmakinde *et al.* (2022); Abebe *et al.* (2021) and Dinku (2018). ARI was negatively significant to the choice of CPLN. Specifically, the likelihood of households with low access to infrastructure choosing CPLN was reduced by 42.9% relative to the base

category. This is in consonance with the findings of Gebbisa and Mulatu (2020).

**CFN:** age of household head decreased the likelihood of choosing CFN by 10.5% while tertiary education increased it by 31.1%. On the contrary, the likelihood of going into fishing was reduced by 7.7% among the landless respondents. This might be due to high cost of renting land. Credit access increased the likelihood of choosing CFN by 37% relative to the base category. This agrees with the findings of Abebe *et al.* (2021) and Gani *et al.* (2019). ARI was positively significant to the livelihood choice of CFN at 10%. Specifically, the likelihood of households with high infrastructure access choosing CFN was increased by 32.4% relative to the base category. This is in consonance with the findings of Velasco-Muñoz, J.F., *et al.* (2018).

### Conclusion

The study examined the effect of rural infrastructure on livelihood choice in SWN. It provided empirical evidence that rural infrastructure access influenced households' livelihood choice for CPLN and CFN. Households in developed communities were more likely to diversify their livelihoods into more profitable activities which would lead to increased income and eventually improve the welfare of their members.

### Recommendation

The study recommends that adequate provision of infrastructure by Government and Non-Governmental Organizations should be ensured so that households that are already engaged in the CPLN and CFN livelihood choices can expand their scale of production and increase their productivity, level of income and food security. Likewise, more households will be encouraged to go into the production of poultry livestock and fish which are essentially the main sources of protein. Government should make land readily available for landless households willing to engage in these enterprises. Policy makers should make the establishment of more schools top priority and increase the awareness of the importance of education among rural farming households through various sensitization programs. Government and financial institutions should increase access to credit by rural farming households by making soft loans easily accessible to them.

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