EFFECT OF WATER SECURITY STATUS ON RURAL HOUSEHOLDS' LIVELIHOOD SECURITY IN KWARA STATE, NIGERIA

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ABSTRACT
This study assessed the effect of water security status on rural households' livelihood security in Kwara State, Nigeria. A total of 384 household heads were randomly selected from 24 villages in the study area. Binomial Logistic Regression, Water Security Index, and Household Livelihood Security Index were the tools used for the data analysis. The result revealed that 54.8% of the rural households were water secure, while 45.2% of them were water insecure. The result further showed that 59.3% of the rural households had low livelihood status, while the remaining 40.68% had high livelihood status. Binomial logistic regression revealed that were water security index, farming as primary occupation, amount of credit accessed and extension visits. The study concluded that water security had a positive effect on the livelihood security of rural households. It is therefore recommended that Kwara State government should increase efforts by providing appropriate funding to relevant agencies toward provision of potable water sources across the rural areas. Government through relevant agencies should sensitize rural households on the need to form cooperative societies in their community so that they can save, and also have access to credit for the expansion of business and thereby improve their livelihood.

Keywords: Water Security, Livelihood Security, Rural Households and Binomial Logistic Regression
JELCodes: Q2, Q5

1. INTRODUCTION
Water is an essential natural resource for life, good health and livelihood security (Aromolaran et al., 2019). Water use for domestic purposes, sanitation, and hygiene is acknowledged as a basic human necessity and a fundamental human right (United Nations General Assembly, 2010). The efficacy of agriculture, energy, transportation, and other industries depend on the

availability and sufficiency of water (Siwar & Ahmed, 2014). According to United Nations (2015), Sustainable Development Goal (SDG) 6 focused on providing access to and sustainable management of water and sanitation for all people.

Water security refers to "the capacity of a population to safeguard sustainable access to adequate quantities of water with the acceptable quality necessary for sustaining livelihoods, human well-being, socio-economic development, ensuring protection against water-related disasters, and for preserving ecosystems in a climate of peace and political stability" (United Nations-Water, 2013). It is essential for attaining sustainable growth. However, water is becoming a more limited resource for people across the world due to climate change, water pollution, and increasing populations (Olivia, 2022). Water degradation has become a global issue due to increase in the human population and economic activities. (Biswas & Tortajada, 2019). According to United Nations International Children's Emergency Fund (UNICEF) (2021), 1.42 billion people reside in places that are very or extremely vulnerable to water. Therefore, the greatest danger to world prosperity is the water crisis. Nigeria is among the African nations with water security issues (Adejumo, 2020).

Nigeria's water security challenges are overwhelming, as over 69 million individuals are without access to improved sources of drinking water (UNICEF, 2018). Kwara State is one of the states in North-central Nigeria, the state suffers from the water insecurity challenges especially during the peak of dry season. The scarcity of water can be linked to the drying up of wells, streams, rivers and among others (Ifabiyi et al. 2019). Rural people in the country mostly depend on self-water supply from wells, rain, rivers, boreholes and streams for domestic, livestock production, backyard gardens, processing of farm produce and other livelihood activities. During the dry season, most of these sources become inaccessible, forcing households to expend a significant amount of time and resources to obtain water of doubtful quality. Women and children must cover long distances to fetch water. The hours spent on water collection reduces the time spent on education, income generation, agriculture and other livelihood activities. Also, the stress passed through by rural households to get water of uncertain quality severely harms their health. The livelihoods' output may be impacted directly or indirectly. Due to water shortage, the cost of water as an input might raise the production cost. (Aromolaran et al., 2019). The scarcity of water resources has resulted in ecological degradation, loss of livelihood, deteriorating health, and increased food insecurity (Guppy & Anderson, 2017).

According to Mishra et al., (2021), securing safe, reliable and adequate water for households and the environment is essential for achieving sustainable development goals such as enhanced income generation, uplift of rural economies, poverty eradication and reduced incidence of hunger. It is therefore necessary to determine the effect of water security status on rural households' livelihood security and suggest ways to improve the water and livelihood security of rural households in Kwara State, Nigeria. This informed the undertaking of the study. The introduction concludes with the justification for the study followed by literature review which summarizes some important literature on the subject. The methodology, results and discussion of findings come next, while conclusion, policy recommendations and reference conclude the paper.

2. LITERATURE REVIEW

2.1 Theoretical Literature

Water security is gradually recognised as a framework to address human and ecological needs related to adequate, safe and sustainable water use (Cook & Bakker, 2012). The discussion on safety and securitisation arose from global relations as actions designed to neutralise the danger to state interests. (Buzan et al.1998). Early uses of the idea centred on the requirement for

water security to enhance land usage for the production of food and required materials, increase regional settlement, and maintain national security (Bogardi et al., 2015). Several scholars propounded numerous definitions to understand the concept of water security. According to Global Water Partnership (2000), water security is defined "as a goal where every person has access to enough safe water at an affordable cost to live a clean, healthy and productive life while ensuring the environment is protected and enhanced". Swaminathan (2001) stated that water security refers to "the availability of water in adequate quantity and quality in perpetuity to meet domestic, agricultural, industrial and ecosystem needs". Cheng et al. (2004) described water security "as access to safe water at an affordable cost to enable healthy living and food production while ensuring the water environment is protected from water-related disasters, such as droughts and floods are prevented". The recent definition of water security focused on "the capacity of a population to safeguard sustainable access to adequate quantities of water with the acceptable quality necessary for sustaining livelihoods, human well-being, socio-economic development, ensuring protection against water-related disasters, and for preserving ecosystems in a climate of peace and political stability" (UN-Water, 2013). These definitions, despite significant differences, share a number of characteristics, including availability, accessibility, quality, safety, and stability.

2.2 Empirical Review

Isa et al. (2023) investigated the causes of water scarcity in the Minna metropolitan area of Niger State. Descriptive and inferential statistics were employed to analyse the data. The result showed that inadequate resources, inadequate pumping infrastructure, increasing population, poor road infrastructure and inadequate water distribution tanker were significant factor causing water scarcity. The study recommended that a sustainable water supply is essential to address Minna's water scarcity issues.

Mugejo and Ncube (2022) reviewed the factors influencing water security in South African smallholder farming systems. The finding revealed that inadequate infrastructure, poor water infrastructure, land tenure and non-involvement of farmers in water-related management activities as the significant factors influencing water insecurity of smallholder farmers. The study recommended that addressing problems related to water infrastructure availability, allocation and distribution, and the ability to operate, manage and maintain the infrastructure would help solve water security problems.

Thulani et al. (2021) assessed the determinants of the water security status for rural households from Melani-inland and Hamburg-coastal communities in the Eastern Cape Province, South Africa. The Water Poverty Index (WPI) and the Tobit regression model were the statistical techniques employed. The result showed that there is little water security issue, mostly as a result of the scarcity of water and the length of time required for water collection. The result of Tobit regression revealed that water rate, the type of toilet used, and time spent for collecting water contribute to households' water security in the study areas. The study recommended that policy options that ensure affordability of water, access to non-water using flush toilets and guarantee availability of tap water.

In another study, Baba-Adamu and Jajere (2020) used the Water Security Vulnerability Index (WSVI) and descriptive statistics to investigate the susceptibility of rural households in Yobe State to water scarcity. For this study, primary data were utilized. The research found that surface water bodies, boreholes, and hand-dug wells were water sources. The finding indicated that the more than half of the surveyed respondents experienced severe to extreme water scarcity. The research, therefore, suggests more funding for the rural water supply, which would also improve the socioeconomic of the populace.

Simelane et al. (2020) used the Eswatini Multiple Indicator Cluster Surveys (EMICSs) to identify the factors influencing access to improved drinking water sources in Eswatini between 2010 and 2014. The factors influencing the household's ability to access improved drinking water sources were examined using a bivariate and multivariate complementing log-log regression analysis. The result revealed that access to improved drinking water sources was positively associated with the household wealth index, whereas access to improved drinking water sources was negatively correlated with household size in both years.

Gap in Literature

There are sizable studies across the world on the water security and its determinants (Baba-Adamu & Jajer, 2020; Isa et al. 2023; Simelane et al. 2020; Mugejo & Ncube, 2022; Thulani et al. 2021). However, this current study seeks to differ by analyzing the effect of the water security status on rural households' livelihood security in Kwara State, Nigeria.

3. METHODOLOGY

3.1 Theoretical Framework

The theoretical foundation of this study is rooted in the theory of utility maximization. Utility refers to the satisfaction derivable from consuming a particular good or service. Utility theory concerns people's decisions on preferences, worth, value and goodness (Fishburn, 1968). Thus, this theory presupposes that the utility maximization principle directs all decisions. The theory also explains the economic behaviour of rural households. It is assumed that the decision to secure safe, reliable and adequate water is influenced by the expected utility to be derived from it. Water is required for domestic and livelihood activities such as watering backyard gardens and livestock, processing farm produces, etc. Therefore, the outcome of the decision made by a rural household to be water-secure is expected to improve the household's livelihood security, increase income, reduce the incidence of diseases, enhance hygiene and sanitation as well as improve quality of life.

3.2 Study Area

This study was conducted in Kwara State. It is one of the six states in North-Central Nigeria. Kwara State was created in May 1967. The state comprises 16 local government areas, and Ilorin serves as its capital. The four main ethnic groups in the State are Yoruba, Baruba, Nupe, Hausa/Fulani, with migrants from other federation states (Kwara State Ministry of Information, 2002). The primary occupation in the state is agriculture, with more than 70 percent of the population engaged in farming. The projected population of the state was about 3,192,893 (National Bureau of Statistic [NBS], 2017).

The state is situated geographically between Latitudes 7^0 45'N and 9^o 30'N and longitudes 2^o 30'E and 6^o 25'E. The total land area of the state is about 35,500km^2, representing approximately 3.5% of Nigeria's total land area, which is 923,768km^2 (Kwara State Government [KWSG], 2006). The state has vegetation ranging from rainforest to wooded savannah. Wet and dry seasons are the two main climatic conditions of the state, with some cold and dry harmattan from December to January. The average daily temperature is from 30°C to 35°C, while the annual rainfall is between 1000mm and 1500mm. The principal food crops grown are cassava, yam, maize, millet, cowpea, rice etc. The state of harmony is also appropriate for livestock production (KWSG, 2006). The topography of state comprises hills, valleys and plain lands. The River Niger is a significant river that traverses the state, while the other rivers include Asa, Awun, Aluko, Osin, Oyun and Owu Fall, which serve as tourist attractions.

3.2 Sampling Technique

The population for the study comprises all rural households in Kwara State from which sample was selected. Sample size for the study was determined using the Cochran (1977) formula:

$$n_{household} = \frac{z^2pq}{e^2} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(1)$$

Where $n_{household}$=the number of rural household heads for this study; z =the selected critical value of desired confidence level usually at 95% level (1.96); p=the estimated proportion of an attribute that is present in the population assumed to be a maximum variability of 50% (p=0.5); q=1-p; and e=the desired level of precision $\pm$5% (e=0.05), a total of 384 representative households were required for the study.

A two-stage random sampling technique was used to select the respondents for the study. The first stage involved random selection of six villages in each of the four Agricultural Development Programme (ADP) zones making a total of 24 villages using the complete list of villages in Kwara State. In the second stage, 16 households were randomly selected in each of the selected villages, making a total of 384 rural households as shown in Table 1. The questionnaire was administered to 384 respondents. However, data from 354 of the respondents that have complete information and were used for the analysis.

Table 1: Sampled Rural Communities and Sample Size Selection

ADP Zones	Sampled Rural Communities	Sample Size
A:	Aboki	16
Baruten and	Venra	16
Kaiama Local	Kuguzi	16
Government Areas	Okuta	16
	Yashikira	16
	Shiya	16
B:	Tsaragi	16
Edu and Patigi	Gbugbu	16
Local Government	Shonga	16
Areas	Patigi	16
	Tankpafu	16
	Lade	16
C:	Elerinjare	16
Asa, Ilorin East,	Aboto	16
Ilorin South, Ilorin	Fufu	16
West and Moro	Elesinmeta	16
Local Government	Olodo	16
Areas	Tepatan	16
	Isapa	16
D:	Oko	16
Ekiti, Ifelodun,	Iloffa	16
Irepodun, Isin,	Ojoku	16
Offa, Oke-Ero and	Obbo	16
Oyun Local	Aiyegunle	16
Government Areas	Ekanmeje	16
Total		**384**

Source: Field Survey, 2024

3.3 Sources of Data and Method of Data Collection

Data for this study were collected from primary source using semi-structured questionnaire and it was administered to rural household heads using's computer-assisted personal interview on the Kobotoolbox App. Data obtained from rural households includes socioeconomic characteristics, crop yield, income sources of water, quantity of water fetched and consumed, livelihood factors etc. Also, out of 384 copies of questionnaire administered, 354 copies with useful information were used for the analyses. Analytical techniques employed were water poverty index, household livelihood security analysis, binomial logistic regression, and seemingly unrelated regression analysis were used to analyse data.

3.5 Methods of Data Analysis

3.5.1 Water Security Index

Water Security Index was used to determine the water security status of rural households and was adapted from water poverty index. According to Sullivan et al. (2006), water poverty index comprises five components which are resource (R), access (A), use (U), capacity (C) and environment (E). Each of the five components is made up of many indicators. The water poverty index for the study is expressed, according to Sullivan et al. (2006).

$$WPI = \frac{wrR + waA + wcC + wuU + weE}{wr + wa + wc + wu + wE} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where WPI = Water Poverty Index value for a household, w = weight applied to each component and indicator.

The indicators for WPI were:

1. Resource Indicator (R)
   The indicators used to estimate the physical availability of water resources for households are:
   a. Extent of availability of pipe-borne water during the rainy and dry season (5-Point Likert type scale; strongly disagree = 1, disagree = 2, neutral =3, agree = 4, strongly agree = 5)
   b. Extent of availability of borehole water during the rainy and dry season (5-Point Likert type scale; strongly disagree = 1, disagree = 2, neutral =3, agree = 4, strongly agree = 5)
   c. Extent of availability well water during the rainy and dry season (5-Point Likert type scale; strongly disagree = 1, disagree = 2, neutral =3, agree = 4, strongly agree = 5)
   d. Extent of availability of river water during the rainy and dry season (5-Point Likert type scale; strongly disagree = 1, disagree = 2, neutral =3, agree = 4, strongly agree = 5)
   e. Extent of availability of stream water during the rainy and dry season (5-Point Likert type scale; strongly disagree = 1, disagree = 2, neutral =3, agree = 4, strongly agree = 5)
   f. Extent of availability of spring water during the rainy and dry season (5-Point Likert type scale; strongly disagree = 1, disagree = 2, neutral =3, agree = 4, strongly agree = 5)
   g. Taste of water, does the water consume is tasteless? (Yes = 1, No=0)
   h. Odour of water, does the water consume is odourless? (Yes = 1, No=0)
   i. Colour of water, does the water consume is colourless? (Yes = 1, No=0)
2. Access (A)
   The indicators employed to estimate the extent of household access to water were:
   a. Disputes among households over water in the last twelve months (3-Point Likert type scale; serious = 1, minor = 2, no =3)

b. Eff ort to collect water (3-Point Likert type scale; high = 1, little=2, no =3)
c. Danger to collect water (3-Point Likert type scale; high = 1, low = 2, no =3)
d. Time spent for water collection (minutes/trip)
e. House distance to the river (km)
f. House distance to pipe-borne water (km)
g. House distance to well (km)
h. House distance to stream (km)
i. House distance to river (km)
j. House distance to spring (km)

3. Capacity (C)
   The indicators used to measure the effectiveness of a household's ability to manage water were:
   a. Household income; both farm income and non-farm income (amount in naira)
   b. Frequency of health & hygiene sensitisation (number in the last 12 months)
   c. Frequency of illness related to water (number in the last 12 months)
   d. Access to electricity (hours per day)
4. Use (U)
   The indicators used to estimate ways in which water is used for diff erent purposes were:
   a. Domestic water used per capita per day (litres/day)
   b. Quantity of water used to wet backyard farm garden (litres/day)
   c. Quantity of water used for processing of farm produce (litres/day)
   d. Quantity of water used for livestock (litres/day)
   e. Quantity of water used for other livelihood activities (litres/day)
5. Environment (E)
   The indicators employed to estimate the need to allocate water for ecological services were:
   a. Occurrence of drought (number in the last five years)
   b. Occurrence of flood (number in the last five years).
   c. Occurrence of soil erosion (number in the last five years).
   d. Frequency of application of pesticides/herbicides (number per crop season).
   e. Frequency of fertilizer application (number per crop season).

The estimation of the indicators
These indicators were acknowledged based on their significance, and it is assumed that every indicator has the same weight and adds to the household water security index. The selected indicators have different measurement units and were standardized following the procedure for measuring household water security status adopted by Hailu et al. (2020). Then, the indicators were added up to give a composite indicator. Using water resource indicators, for example
Taste of water, does the water consumed is tasteless? (Yes = 1, No=0)

$$\text{Taste of water index} = \frac{\text{Indicator} - \text{Minimum value}}{\text{Maximum vaule} - \text{Minimum value}}$$

Where:
Indicator is the taste of the water, minimum value of taste of the water and maximum value of taste of water
Odour of water, does the water consumed is odourless? (Yes = 1, No=0)

$$\text{Odour of water index} = \frac{\text{indicator} - \text{Minimum value}}{\text{maximum vaule} - \text{minimum value}}$$

Where:

Indicator is the odour of water, minimum value of odour of water and maximum value of odour of water
For the composite indicator, all the values of the indicators were summed and divided by n, where n=5.

$$\frac{\text{Water Resource avaiability indicator} + \text{Access indicator} + \cdots + \text{evironment indicator}}{\text{n}}$$

The water security status of the rural households was classified into water secure and water insecure by using the water security index average. Hence, any household with a score of less than mean was regarded as water insecure, while households with score greater than or equal to mean were categorised as water secure (Gariba & Amikuzuno, 2019; Ngasala et al., 2018).

3.5.2 Household Livelihood Security Analysis

Household Livelihood Security (HLS) Analysis was employed to measure the livelihood security status of the farming household. HLS index uses a balanced weighted average approach with many indicators where each indicator contributes equally to the overall index. The indicators used to compute the composite HLS were grouped into five security domains which are economic, food, health, education, and empowerment.

1. Economic Security Indicator

The indicators used to estimate the economic security index of households were:

- Household per capita farm income = $\frac{\text{Farm income}}{\text{Adjusted household size}}$
- Household per capita non-farm income = $\frac{\text{Non−farm income}}{\text{Adjusted household size}}$
- Household per capita asset value (Naira)
- Active population (15 – 59years) ratio = $\frac{\text{No.of active household members}}{\text{Total household size}}$

2. Food Security Indicator

The indicators used to estimate the food security index of households were:

- Household dietary diversity score (No. of food groups per day)
- Food frequency (No. of meals and snacks per day)
- Household per capita monthly food expenditure (Naira per month)

3. Health Security Indicator

The indicators used to estimate the health security index of households were:

- Number of days unable to work due to sickness in the last 30 days
- Frequency of visiting the hospital in the last 30 days

4. Education Security Indicator

The indicators used to estimate the education security index of households were:

- Number of household adult males with formal education
- Number of household adult females with formal education
- Number of 6 – 10 years children enrolled in school
- Number of > 10 years children enrolled in school

5. Empowerment Security Indicator

- Membership of community societies (No. of societies belonging to)
- Proportion of household members in society
- Leadership role in society.

The estimation of the indicators

The quantitative approach was employed to estimate the HLS status of rural households. The indicators to compute the HLS index were economic, food, health, education and empowerment. Each indicator measures on a different scale. Therefore, selected indicators were standardized following the approach adopted in measuring Life Expectancy in Human Development Reports (also adopted by Hahn et al., 2009). Using the food security indicator as an example

Household dietary diversity score (No. of food groups per day)

$$\text{Household dietary diversity score index} = \frac{\text{Indicator} - \text{Minimum value}}{\text{Maximum vaule} - \text{Minimum value}}$$

Indicator is the dietary diversity of the respondents

Minimum value of dietary diversity of the respondents

Maximum value of dietary diversity of the respondents

Food frequency (Number of meals and snacks per day)

After that, the values obtained from the above indices were added and divided by number of indicators to give a food security indicator. The same procedure was followed to obtain values for other indicators, and division was based on the number of indices under each indicator.

For the composite indicator, all the values of the indicators were summed and divided by n, where n=5.

$$\frac{\text{Economic security indicator} + \text{food security indicator} + \cdots + \text{empowerment security indicator}}{\text{n}}$$

Household Livelihood Status (HLS) of the rural households was classified into Low HLS and High HLS by using the Household Livelihood Security Index average.

3.5.3 Binomial Logistic Regression Model

Binomial Logistic Regression model was employed to determine contribution of water security status to the livelihood security of rural households in Kwara State. The model is a linear regression tool with a binary response variable. The binary logistic regression is the appropriate tool when the dependent variable is dichotomous and used for predicting the presence or absence of a dichotomous variable based on values of a set of predictor variables (Borooah, 2002).

According to Norusis (1993), the relationship between the binary status variable (S_i) and the determinants X_i is specified as $S_i = \beta X_i + V_i \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots (3)$

Where S_i = Binary livelihood security status. It takes the value of 1 for high livelihood security rural households and zero for low livelihood security rural households.

β = Vector of the respective parameter which is estimated using maximum likelihood.

X_i = Independent variables and V_i = error term.

According to Norusis (1993), the probability of an event occurring is estimated as:

$$\text{prob (event)} = \frac{1}{1+e^{-z}} \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots (4)$$

Z = Linear combination and expressed as:

$$Z = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \cdots \beta_n X_n \cdots\cdots\cdots\cdots\cdots\cdots\cdots (5)$$

For this study, the event is the livelihood security status of rural households

= β_0 and β_1 are the coefficient of the parameters.

i =1, 2, 3……n

The independent variables hypothesised as determinants of livelihood security of rural households were specified as follows:

Z_1 = Water Security Index

d_1= Farming as primary occupation of household (farming =1, Non farming =0)
d_2 = Marital status of household heads (married=1, others=0)
d_3 = Gender of household heads (male=1, others=0)
X_1= Age of rural household heads (years)
X_2 = Household size (adult equivalent)
X_3 = Extension visits (Number of contacts within the cropping season)
X_4 = Amount of credit received (amount in naira)
X_5 = Farm size (hectare)

4. RESULTS AND DISCUSSION

4.1 Water Security Status of Rural Households

The water security index was computed using Water Security Index. Five water security indices were estimated, namely; water resource availability, water accessibility, water use, capacity and environment. The composite water security index of rural households was measured using these five indices aggregated over 33 indicators. The index score ranging from 0 to 1 was categorized into two. The mean value of water security index was estimated and on the basis of this, households were categorized into; water secure and water insecure. Figure 1 shows the chart of the percentage share of water security components in the water security index. Table 2 presents the distribution of rural household water security status.

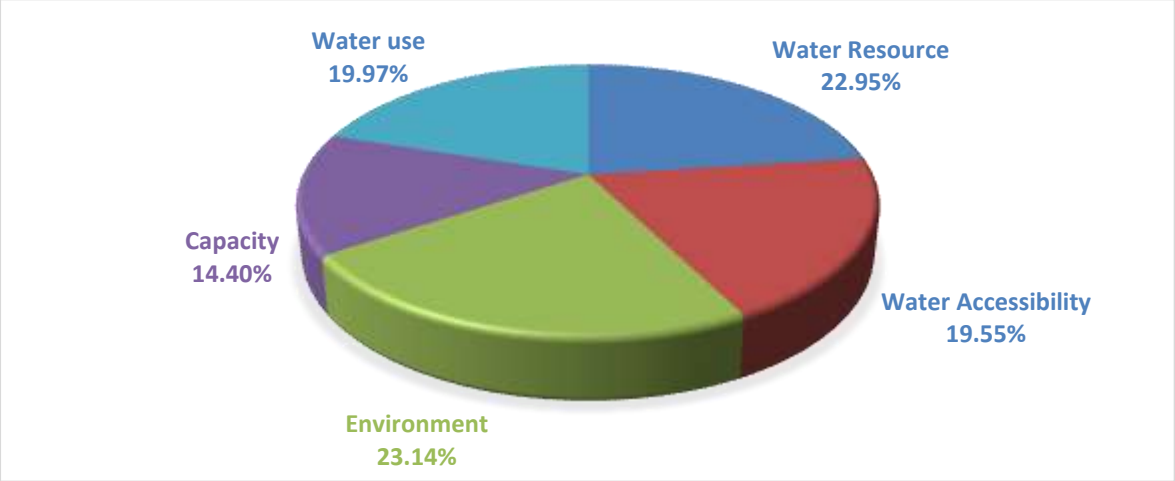

Figure 1: Percentage Share of Water Security Components in the Water Security Index Source: Data Analysis, 2024

Figure 1 shows the pictorial representation of the percentage share of water security components in the water security index by assessing the share of each of the five water security indices modelled to the composite water security index. It can be observed from the figure that environmental indicator had contributed the highest (23.14%) share to the composite water security index. This could be attributed to the fact that the study area is not prone to the problem of flooding, erosion and drought in the last five years. The least (14.40%) contributor share to the composite water security index was capacity indicator. As revealed in Figure 1, water resource availability added 22.95% to the composite water security index, water use added 19.97% while water accessibility contributed 19.54% to composite water security index.

Table 2: Water Security Status of Rural Households

Classification	Water Security Index (%)	Frequency	Percentage
Water Secure	≥ 0.63	194	54.80
Water Insecure	< 0.63	160	45.20
Total		**354**	**100**

Source: Field Survey, 2024

The result obtained in Table 2 shows that 54.80 percent of the rural household were water secure, while 45.20 percent of them were water insecure. The mean water security index was 0.63. This implies that a high proportion of the households in the study were water insecure. This result is contrary to the findings of Nounkeu et al. (2019) who found that 58% of rural households in Menoua Division, West Cameroon were water insecure.

4.2 Livelihood Security Status of Rural Households

The livelihood security of rural households in the study area was assessed using the composite Livelihood Security. Five livelihood security indices were estimated namely; Economic Security Index, Food Security Index, Education Security Index, Empowerment Security Index and Health Security Index. The Composite Household Livelihood Security Index (HLSI) of rural households was measured using these five indices aggregated over 16 indicators. Figure 2 illustrates the chart of the percentage share of livelihood security indices in the composite Household Livelihood Security Index.

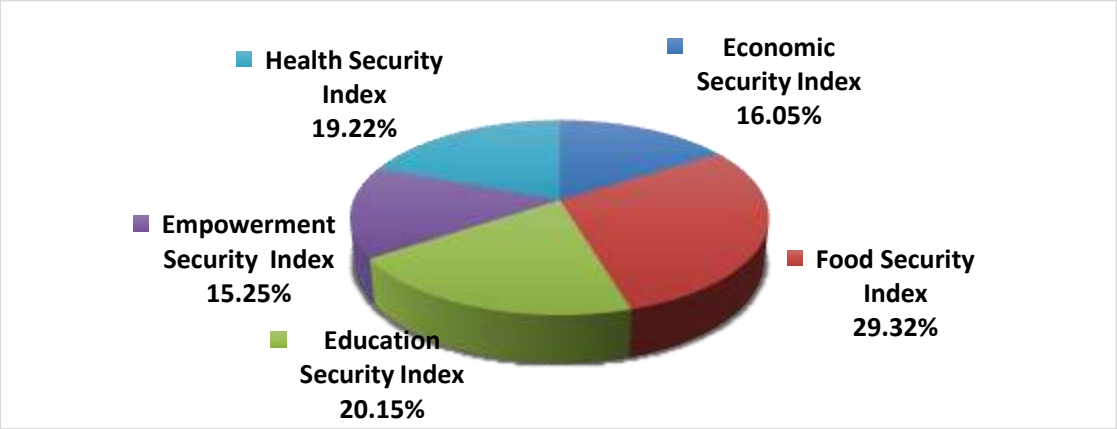

Figure 2: **Percentage Share of Livelihood Security Indices in the Composite Household Livelihood Security Index**
Source: Data Analysis, 2024

Figure 2 reveals the pictorial representation of the percentage share of livelihood security indices in the composite Household Livelihood Security Index by assessing the share of each of the five livelihood security indices modelled to the composite HLSI. It can be observed from the figure that Food Security Index added the highest (29.32%) share to the composite HLSI, while the Empowerment Security Index added the least (15.25%) share to the composite HLSI. This result is in line with findings of Oyedeji and Babatunde (2022) who reported that rural households were more secured in terms of food security relative to other domains of livelihood security.

4.2.1 Distribution of Household Livelihood Security Index

The section presents the distribution of rural households according to household livelihood security index. Table 3 presents the classification of household livelihood security estimated in the study.

Table 3: Distribution of Household Livelihood Security Index

Categories	Frequency	Percentage
<0.1	1	0.28
0.10-0.19	106	29.94
0.20-0.29	165	46.61
0.30 & above	82	23.17
	354	**100**

Source: Field Survey, 2024

As shown in Table 3, an appreciable percentage (46.61%) of the household heads were within the livelihood security indices of 0.20-0.29 while 29.94 percent of them were within the livelihood security indices of between 0.10-0.19. The findings further revealed that 23.17 percent of the respondents were within the livelihood security indices of more than 0.3 and 0.28 percent of the respondents were within the livelihood security indices of less than 0.1.

4.2.2 Classification of Household Livelihood Security of Rural Households

The household livelihood security index of respondents was classified into two: High and Low livelihood. The respondents were classified using the estimated mean value of composite HLSI which was 0.25. Such that any household with a score below this mean value was classified to have low livelihood security while households equal to or above this mean value were classified to have high livelihood security.

Table 4: Household Livelihood Security Index of Respondents

Classification	HLSI	Frequency	Percentage
Low livelihood status	< 0.2518	210	59.32
High livelihood status	≥ 0.2518	144	40.68
Total		354	100.00

Source: Field Survey, 2024

The result on Table 4 indicates that 59.32 percent of the respondents had low livelihood security while 40.68 percent of them had high livelihood security with respect to the estimated sample mean composite HLSI. This means that majority of the respondents had low livelihood security. This result is corroborated by the findings of Ogunbiyi (2023) who reported that majority of rural households in Kwara and Niger States had low livelihood security index.

4.3 Contribution of Water Security to the Livelihood Security of Rural Households

Contribution of water security to the livelihood security of rural households was presented in Table 5

Table 5: Contribution of Water Security to the Livelihood Security of Rural Households

Variable	Coefficient	Standard error	P>|t|	Marginal Effects
Water Security Index	0.2375***	0.0721	0.000	0 .0921
Age (Years)	-0.0210	0.0137	0.125	-0 .0050
Gender (Male=1)	0.4654	0.3307	0.159	0.1061
Household size (Number)	0.0019	0.0786	0.981	0.0004

Farming as primary occupation (Yes=1)	0.7730**	0.3240	0.017	0.1713
Marital status (married=1)	-0.1290	0.3100	0.677	-0.0307
Amount of credit accessed (Naira)	9.32e-06***	2.69e-06	0.001	2.22e-06
Farm size (Hectare)	0.0321	0.0726	0.658	0.0076
Extension visits (Number)	1.4699***	0.3244	0.000	0.3517
Number of observations 354				
Log likelihood -210.09979				
LR chi^2 (9) 58.17				
Prob > chi^2 0.0000				

Source: Data Analysis, 2024; *** P<0.01 and **P<0.05

The result of Tobit regression analysis reported log likelihood of -210.09979 and a chi-square value of 58.17 which is significant at 1% (0.0000). The model is statistically significant, which implies that the model is capable of explaining the variables and should be retained. The significant factors that influenced livelihood security of rural households were water security index, farming as primary occupation, amount of credit accessed and extension visits.

As shown in Table 5, water security index had a positive and significant contribution to the livelihood status of the rural households at a 1% statistical level of significance. This implies that a unit increase in the water security index of the households will likely bring about a 2% increase in households' livelihood status, ceteris paribus. This may be linked to the fact that households with adequate and good quality water will be able to produce enough food especially during the dry season with little or no time been wasted on sourcing for water. Households tend to direct all energy on income generating activities thereby leading to improved livelihood security.

Farming as primary occupation was found to be positive and significant at 5%. This means that a unit increase in the number of households that engaged in farming as their primary occupation will probably bring about 17% increase in the livelihood security index of the households, ceteris paribus. This indicates that household that engaged in farming as their primary occupation will likely have high livelihood security index. This implies that the rural household that takes farming as their primary occupation tends to direct all their energy on farming activities and in turn lead to a better livelihood. This result is in line with the findings of Ogunbiyi (2023) who reported that farming as major occupation significantly influenced livelihood status of farming households in Kwara and Niger States.

The coefficient of amount of credit accessed was found to be positive and significant at 1%. This implies that a unit increase in the amount credit received by the household heads will likely bring about 2.22e-06 increase in the livelihood security status of the households, ceteris paribus. This could be attributed to the fact that household heads with good access to credit can help in expanding their business, consequently generate more income that would make their livelihood better off. This means that as rural households receive additional money, their livelihood will also improve.

Number of extension visits had a positive and significant influence on the household livelihood security at 1% statistical level of significance. This implies that a unit increase in the number of extension visits will probably bring about 35% increase in the livelihood security of rural households. This could be attributed to the fact that access to extension services is expected to improve the knowledge and skills of household heads on innovation of farming practices and thereby improving their livelihood security index. This result is corroborated by the findings of Loki and Mdoda (2023) who reported that extension visits had positive influence on livelihood of farmers in in Eastern Cape Province, South Africa.

5. CONCLUSION AND POLICY RECOMMENDATIONS

The study assessed the effect of water security status on rural households' livelihood security in Kwara State, Nigeria. Findings revealed that majority of the rural household were water secure. The result also showed that majority of the households had low livelihood security. The significant factors that influenced livelihood security of rural households were water security index, farming as primary occupation, amount of credit accessed and extension visits. The study concluded that water security had a positive effect on the livelihood security of rural households.

Based on the findings of the study, the study recommended that:

i. Kwara State government should increase their efforts in providing appropriate funding to relevant agencies toward provision of potable water sources across the rural areas of the state;

ii. government through relevant agencies should sensitize rural households on the need to form cooperative societies in their communities so that they can save, and also have access to credit for the expansion of business and thereby improve their livelihood.

iii. government should provide adequate funding to Kwara State Ministry of Agriculture and Natural Resources to ensure agricultural extension package is made available to rural households so as to enhance their livelihood security.

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