

Chapter 3: Research Methodology

This section describes the study area, the sampling procedure, data collection and analysis. It also presents the justification for the methodology used for this research. This research used both qualitative and quantitative research methods as part of the transdisciplinary research methodology used to study the sustainability of the food system in North-East Nigeria.

3.1. Description of the Study Area

Nigeria lies between latitude 4°N and 14°N and longitude 3°E and 15°E. The study was carried out in North-East Nigeria, which comprises of six (6) states, Borno, Yobe, Taraba, Gombe, Bauchi and Adamawa (Figure 3.1). The selected case-study states, Gombe and Taraba are marked in purple. Worldometer (2019) projected the population of Nigeria to be about 202, 211,000 on the 27th of September 2019, out of which about 13% (25,554,800) live in North-East Nigeria. The North-East geopolitical zone of Nigeria covers 280,419Km², which is about 33% of Nigeria's total land area (923,769Km²)(National Population Commission, 2006; Sources & Traits, 2010).

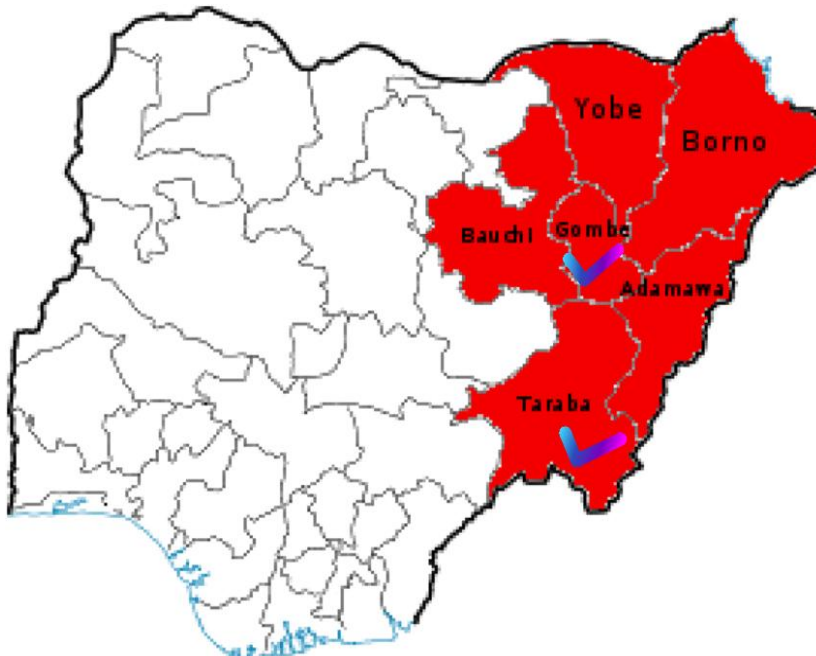


Figure 3.1 A map of Nigeria highlighting states in the Northeast Zone in red

Annual rainfall in the North-East is about 25 inches and average temperature is about 34°C (Dunbar & Udo, 1972). This geopolitical zone shares international boundaries with the Niger Republic to the North, Republic of Cameroon to the East and Republic of Chad to the North-East. The average absolute poverty rate in the North-East is 69 % as against the 60.9% national average making this region the poorest region in Nigeria. Coupled with the conflict in this region, food security has remained a major concern (Nyako, 2015). Livestock including poultry, pigs, fish, cattle, sheep, and goats are reared by households in North-East Nigeria. Many households keep different small livestock like local chickens in their homes for subsistence and traditional ceremonies. The main crops produced in North-East Nigeria include cereals such as rice, maize, millet, guinea corn; vegetables such as fluted pumpkin, pumpkin, *amaranthus*, and pepper; roots and tubers like potatoes, cassava, yam, legumes including melon, cowpea, pigeon pea, yam bean, kidney beans etc. Though crops harvested in Nigeria are largely seasonal due to dependence on rain for farming, most foods are available at all times due to storage. According to the USDA crop calendar for Nigeria, there is the main harvest season and mid harvest times. So, harvest for different foods happens at different time due to the mixed cropping season practice by farmers in Nigeria. These different harvest seasons also make food available all through the year for the farming households.

Sources of food in the North-East Nigeria food system is dominated by forest food harvest, food purchased from local markets and food produced by small-scale farmers practicing mixed farming and mixed cropping. Although there is little monocropping going on in this area, mixed crop farms provide most of the foods eaten in Nigeria(Sabo et al., 2017).

Most of the households in northern Nigeria are in polygamous relationships and, consequently, have larger household sizes and more people to feed compared to other regions of the country (Owoo, 2017). The North-East records the highest poverty, illiteracy, food insecurity and civil unrest rate in Nigeria. Consequently, it has been the focus for international humanitarian assistance for some time. Households in North-East Nigeria generally consist of farmers, who, predominately practice mixed farming and a mixed cropping pattern like most Nigerian farmers (Ndaeyo, Umoh & Ekpe, 2008). Most Nigerian farmers depend solely on rain-fed agriculture for their livelihoods. So, most foods, especially

fruits and vegetables, are seasonal (Ecker et al., 2018). Farm holdings are generally less in size than five hectares of land in Nigeria and, have mostly a combination of inherited and purchased land (Liverpool-Tassie2011).

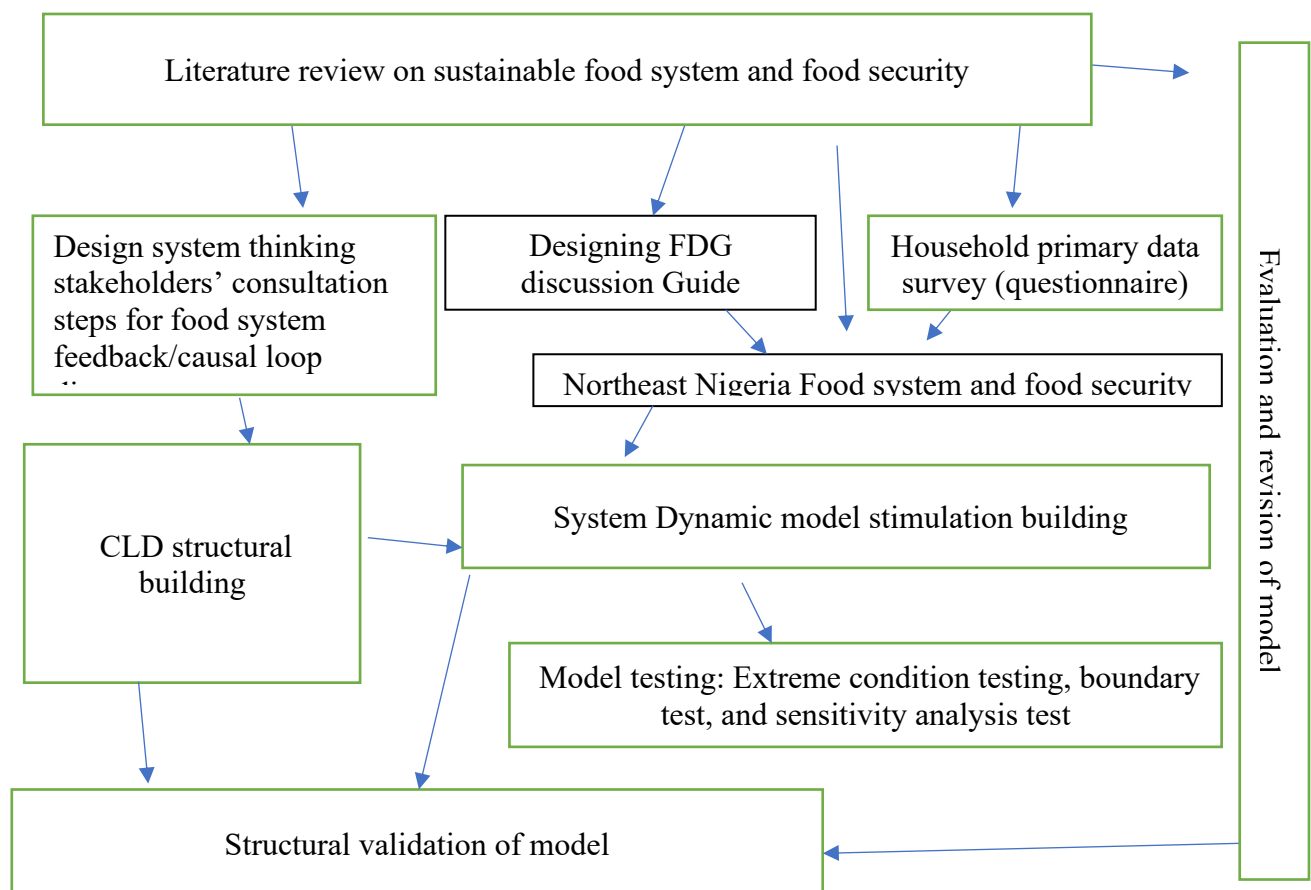


Figure 3.2 **Methodology for developing a sustainable food system dynamics model for food security in North-East Nigeria**

The research methodology diagram shown in Figure 3.2 represents a structured approach used here to analyse the food system in Northeast Nigeria, from initial literature review to the evaluation and revision of the system dynamics model. The process flows from quantitative and qualitative data collection to more detailed modelling and testing, followed by validation and iterative improvement. Below is a step-by-step discussion, integrating the literature review as a possible initial step:

Prior to the data collection, a literature review was conducted to establish a foundation of the existing knowledge about the food system and food security in Northeast Nigeria. This step informed the subsequent design of the system thinking process, and the discussion of the research findings. System thinking is used to map out the feedback loops and causal relationships within the food system. This step involved engaging with stakeholders to understand the food system's dynamics. The steps help to facilitate the identification and understanding of the system elements, feedback loops and causal relationships within the system. The information derived from stakeholder consultation is used to construct a CLD, which visually represents the feedback loops and causal relationships identified. This structural framework serves as a blueprint for the eventual system dynamics model.

A discussion guide for Focus Group Discussions (FDG) was employed to steer the conversations with the researcher to extract detailed insights into Nigerian Agricultural policies and the food system. The focus of this discussion was on Nigerian food security policy thrusts and the sustainable food system goals. Questionnaire were used to collect household level primary data on food production and sources, consumption patterns and the food security situation from the households in the study area.

The final step in the flowchart shown in Figure 3.2 is the evaluation of the model and making necessary revisions. This involved adjusting the model based on the outcomes of the validation and tests to better reflect the reality, and to ensure that the model is useful for decision-making. This iterative process helps to refine the model for better accuracy and reliability. The process is iterative, particularly the final steps involving model validation and revision, suggesting the use of a feedback loop to refine the model continually. The methodology used is iterative and dynamic, incorporating continuous feedback and adjustment to refine the model. This iterative loop ensures the model remains relevant and accurate as new data and insights are gained in the process.

3.2. Sampling methods used

A multistage random sampling technique was employed in picking the households for the study. First, two out of the six states were selected. Second, two agricultural zones were

randomly selected from the selected states, making a total of four agricultural zones. Third, two Local Governments Area were randomly selected from each of the zones, making a total of eight Local Government Areas (LGAs). Fourth, two communities were selected from each of the LGAs, making a total of 16 communities. Finally, 25 households were randomly selected from each of the selected 16 communities to give a total of 400 households for the study. However, eventually, the study obtained data from 375 households, as data collection was seriously interrupted by the COVID 19 lock down. The study used regular households base on the National Population Commission, (2006), which exclude the homeless and people living in the Internally displaced person (IDP) camps. Hence, institutional households like orphanages and the homeless did not form part of this study. Six focus group discussions were also held in the four selected agricultural zones. The stakeholder's consultation was also used in developing the mental model for the causal loop diagram of the food system.

3.3. Data collection

The study used both qualitative and quantitative primary data. The qualitative data were gathered through focus group discussions in the study area. These focus group discussions looked at the effectiveness of the current agricultural policy thrusts on food security, in terms of achieving the needed sustainable food system goals. The results on the effectiveness of the policy trusts are employed in the dynamic modelling of the food system that followed to identify potential sustainable food system interventions. This discussion is important in forming a relevant mental model of the food system. This study also carried out a field survey on households' socioeconomic characteristics, farming activities, forest food harvest and food security in North-East Nigeria. The data analysis used both inferential and descriptive statistics.

Data for this study was collected through three sources- households survey data collection using a structured questionnaire which served as an interview schedule, focus group discussions and stakeholder consultation. Prior to data collection, the planned methods and nature of data to be collected, analysed, and stored went through the University of Reading's ethical clearance procedures successfully.

3.3 Impact of COVID-19 on Households in Nigeria and the Survey Result procedures

The COVID-19 pandemic had profound effects on household in Nigeria, reshaping their livelihoods, agricultural practices, and overall well-being. The disruption in supply chains, limited access to markets, and the challenges of adhering to health guidelines have significantly affected their productivity and income levels. Furthermore, the pandemic has exacerbated pre-existing vulnerabilities such as limited access to agricultural inputs and information, financial services, and technology. These adversities have likely influenced their perceptions and responses in this surveys, potentially highlighting an increased awareness of risks, a greater appreciation for food system and resilience-building measures such as diversification and innovation and, possibly, a shift towards more sustainable practices. Understanding these shifts is very important for interpreting results, especially the emotions and enthusiasm in the selected quotes, as the experiences during the pandemic could have altered farmers' priorities, concerns, and their outlook towards agriculture and external support systems.

To minimize the risk of COVID-19 infection and spread during the survey and data collection, several safety measures were implemented: (a) discussions were held outdoors, (b) hand sanitizers, face masks, and handwashing facilities were readily available, (c) social distancing was maintained during interviews, and (d) participants' temperatures were checked before they took part, with instructions to report any COVID-19 symptoms to the organizer.

Table 3.1 Timeline and Methodology of Sustainable Food System Research in Northeast Nigeria (2020-2021)

Data collection method	Data collected	Units	Date
Household survey	Demographic characteristics, Food sources, farming practices, forest food, DDS, food consumption patterns	Households	March – April 2020
Focus group discussion	Effectiveness of Nigerian agricultural policies in achieving sustainable food security	Agroecological zones	October – November 2020

Stakeholders' consultation	Food system modelling data	Farmers, extension agents, agricultural policy makers and researchers working in the northeast Nigeria	December 2020 – February 2021
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3.3.1 Household survey data collection

Due to inadequate and unreliable food security secondary data in Nigeria, this study collected household level primary data from sampled households. DDS was used to capture the number of food groups the household consumed in the last 24 hours before survey.

Semi-structured questionnaires were used in collecting detailed quantitative data from the households by the researcher and other trained field workers (See Questionnaires listed in appendices). Household level data collection lasted for three months, between February and March 2020. Data were collected on the demographic characteristics of the households, crop and animal production, food distribution, food consumption, food sources, subsistence share of food, farm labour, dietary diversity, crop and animal production diversity, income, land ownership and tenure. This data was used to study and build the system dynamic model of the food system.

The Dietary Diversity Score (DDS) was used in assessing households' food security status. Standard statistical tools, and system feedback loops in Vensim were used in exploring the interactions between the food system and food security. Vensim is a specialized system dynamic software for system modelling.

3.3.2 Setting and participants for focus group discussions.

The research was carried out in Taraba and Gombe states located in the North-East geopolitical zone of Nigeria. The zone is troubled with food insecurity and also *Boko haram* insurgency. In the North-East, 83.6% and 68.6% of the households are involved in crop and livestock farming respectively. There are multiple languages in use in this region, with Taraba state alone having over 80 languages (Online Nigeria, 2003). After consulting with the

Agricultural Development Project Offices in Gombe and Taraba State, two enumerators conversant with the language common in area of study were contacted for assistance. The areas selected for the study covered three agricultural zones in each of the states. The focus group participants were adult males and females. The inclusion criteria required that participants were over 18 years of age, responsible for their household's food provisioning and actively involved with their household and farm decision-making. As it has been reported that there are underage marriages, household heads below the age of 18 years were excluded. Persons below the age of 18 are not an adult and the discussion was designed for an adult who is capable to give their consent. To account for this, our criteria for participation was physical observation and self-confirmation of age. The age range of the participants was 22 to 56 years; the average age was 47 years. The groups comprised of adults with, and without, formal education. Most of them had a primary school education (28%) but very few had University education (6%).

Participants were recruited through the support of their village heads (*Mee angwa*). The participants were randomly selected from the list of farmers provided by the village heads. The participants were informed about the study a week before the meeting and a reminder was sent a day before the discussion. Each identified participant who expressed interest was met by the enumerators to inform them of the topic of the discussion. To ensure that the topic of discussion and procedure would be well accepted in the communities, the content of the discussion guide was presented to the community heads. Additionally, the researcher visited the six sites for the discussions to explain the study to the interested participants who were invited for a pre-discussion meeting. Through these pre-meetings, the researcher took note of concerns and contributions that the community thought is important for the study. Most of them indicated labour subsidy and free medical treatment as a way out of their problems.

Two young natives of Taraba State, fluent in both the multiple languages of Taraba and Gombe and English, led the discussion alongside the researcher¹. These fieldworkers were

¹ The discussions were conducted largely in Hausa, Jukun, Tiv, Fulani, Tangale, and Mumuyi languages with occasional translation to and from English.

trained for three days in qualitative research methods and research ethics. For each focus group discussion, there was a Facilitator and a Notetaker. The training covered the overview and objectives of the study, note taking, and how to facilitate discussion without leading the opinions of the discussant and not to be judgmental. The last day of the training was used for field testing. They were to get the discussants focused on the topic of the discussion, keep timing, and to carry along the members of the group in the discussion. They were to be observant and take notes of important points. The discussion guide was used for the training. In addition to the researcher, the enumerators present were individuals that have experience working as research field workers in this area whom the participants trusted. Back translation was used to ensure accuracy and consistency in the meaning of the key terms in the discussion guide. Qualitative data on food systems and food and nutrition security was collected from stakeholders and through focus group discussion in the study area and prepared for analysis between October 2021 and April 2022. The focus groups consisted of household members in charge of food provisioning. The qualitative data was designed to provide deeper understanding of the interactions in the system, and mutually and socially appropriate mental models of key information for dynamic modelling.