TOWARDS AN UNDERSTANDING OF HOUSEHOLDS' VULNERABILITY AMONG GROUNDNUT VALUE CHAIN ACTORS IN NIGERIA

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Abstract: *The Nigerian rural populace is largely excluded from decision-making processes, making them more vulnerable and at greater risk of being unable to establish sustainable livelihoods. Individuals classified as poor or near-poor are particularly susceptible to vulnerability due to limited access to assets and a reduced capacity to cope with risks. This empirical study aims to assess household vulnerability among actors in the groundnut value chain in Nigeria. Vulnerability is examined through the lenses of poverty, health, and access to resources. The study was conducted across the three agroecological zones of Nigeria using a field survey design and a multi-stage sampling procedure. A total of 1,302 farmers, 409 marketers, and 316 processors were surveyed. A significant majority of value chain actors were classified as non-poor. Among groundnut farmers in the Sahel, Sudan, and Guinea Savanna regions, 11.8%, 15.4%, and 18.6% respectively were classified as non-poor. Similarly, approximately 32.18%, 35.14%, and 38.61% of groundnut marketers in these regions were identified as non-poor. The results also revealed variations in healthcare utilisation and access to clean water among groundnut value chain actors. Furthermore, a significant proportion of these actors had calorie intakes below the recommended threshold, and the food consumption patterns indicated a diet predominantly composed of cereals. The study concludes that groundnut value chain actors experience varying degrees of vulnerability. Indicators such as income, healthcare access, water quality, and food resources across the three regions demonstrate that these actors are exposed to diverse levels of vulnerability. Targeted interventions are needed across all domains of vulnerability indicators to effectively address and reduce the risks faced by groundnut value chain actors in Nigeria.*

Key words: *livelihood, vulnerability, resources, food consumption, agroecological zones*

INTRODUCTION

Most people who live in developing nations are rural dwellers who depend on agriculture for their livelihood [12]. Due to their numerous economic functions as a export market, labor market, raw material supplier, and food supplier, rural areas provide a substantial contribution to the growth of the country [10]. Even with these contributions, rural areas are generally characterized by agrarian activities high levels of social control and cohesion], low living standards, and a lack of amenities like clean water, electricity, wholesome food, good health care, a sufficient road network and transportation, and industries, among other things. [6]

Because the rural populace is mostly excluded from decision-making processes, some groups especially largely in rural society are more vulnerable and run a higher risk of not being able to establish a sustainable life. As a result, their development demands are usually disregarded. Individuals who are quickly alarmed by shocks are considered vulnerable. Agriculture is the primary source of income for the majority of rural people in developing nations like Nigeria, with modest trading, weaving, arts and crafts, pottery, and ceramics serving as supplementary pursuits [19].

Food accessibility and income fluctuate due to agriculture's dependence on weather fluctuations [11]. Rural dwellers become more unstable as a result of these swings, and their

poverty level and food insecurity status rise, making them even more vulnerable. Increases in income and its sources will help people obtain essential necessities, lessen poverty, and ultimately improve their well-being [18]. Therefore, rural households, which are more susceptible, need to diversify their sources of income.

One of Nigeria's main reasons for participating in the Groundnut Up-Scaling Project (GUP) by the United States Agency for International Development (USAID) is its ability to interchange commodities effectively, making it unique among African countries. The nation has used a value chain approach to addressing several aspects of the agricultural value chain, which includes fisheries, crops, and animals (including poultry). The federal government, through its ministries, departments, and agencies (MDAs), sets the direction, and the organized private sector and state-level municipal governments carry it out. The main goal of the GUP intervention in Nigeria is to greatly increase smallholder farmers' groundnut productivity, which will improve their incomes, diets, and general health [26].

Groundnut (*Arachis Hypogea L.*) is an important oilseed and food crop for millions of people in Nigeria. It contains a substantial number of essential vitamins and minerals [4]. It is the 13th most important food crop in the world and the 4th most important source of edible oil with at least 25% protein and more than 40% oil [17]. It is one of the most important vegetable oil crops grown globally and all 36 States in Nigeria produce groundnut with production largely concentrated in the Northern region of Nigeria [25]. Groundnut is a widely cultivated legume crop in the semi-arid tropics and has played a significant role in Nigeria's economic development. It serves as both a food and cash crop, with substantial market value for millions of small-scale farmers.

The concept of vulnerability has been defined in various ways, including as anticipated poverty [8], lack of defense, insecurity, susceptibility to shocks and pressures and exposure to risks such as violence, health issues, and social marginalization [5]. [5], suggest that individuals classified as poor or near-poor are particularly susceptible to vulnerability due to their limited access to assets and their reduced capacity to cope with risks. In this research, vulnerability is examined through the lenses of poverty, health, and access to resources including water and food.

According to [26], the value chain concept is a strategic network made up of independent individual or organizations that work together as actors to exploit and generate economic returns by addressing resource scarcity, sharing associated risks and benefits, and investing time, energy, and resources to ensure the relationship succeeds. The goal of the majority of value chain interventions is to help smallholder farmers connect to the market in order to boost earnings and lower poverty [3]. With the goal of creating a hunger-free Nigeria by establishing an agricultural sector that propels income growth, expedites the attainment of food and nutritional security, creates jobs, and establishes Nigeria as a major player in international food markets, the Federal Ministry of Agriculture and Rural Development (FMARD) launched the Agricultural Transformation Agenda (ATA) under the Federal Government's (FG) auspices. This will benefit millions of farmers. With a target of 20 million farmers, the Growth Enhancement Support (GES) investment provided a forum for interacting with important players in Nigerian agriculture and reorienting attention toward the development of an agribusiness-focused, self-sustaining economy [26].

Hunger and low purchasing power are problems for African countries [12]. Nigeria has roughly 25 million people who are highly food insecure and around october, 2024 [13]. Despite the implementation of several initiatives aimed at reducing food insecurity and removing Nigeria from the Global Hunger Index (GHI), the country has failed to achieve this goal, as it consistently ranks highly among the nations with food shortages. Nigeria's GHI score of 28.9 in 2023 indicates that the country is still experiencing severe hunger. More than 40% of rural households experience acute food insecurity, making the country's rural

areas the most affected [18]. In Nigeria, malnutrition is common, particularly among those who live in rural areas. Food insecurity mostly affects the vulnerable, which includes poor people, people with physical disabilities, people with long-term medical illnesses, children, the elderly, smallholder farmers, nursing mothers, and pregnant women. Many of them suffer from delicate illnesses that need to be properly nourished in order to stay healthy. They endure the after effects of either natural or man-made shocks. They are prone to undernutrition and malnutrition, particularly in children [14]. Insufficient consumption of protein and calories can lead to low maternal weight and low newborn weight increase, which can have an impact on the overall health of the household. This is because one of the main causes of undernutrition is a lack of nutrients or food [16]. The majority of smallholder farmers reside in rural areas, making them a vulnerable demographic that also faces the problem of food insecurity.

Still lacking, though, is useful data regarding the vulnerable group's level of food security. The vulnerable segment, however, may experience food insecurity due to their limited food and poor purchasing capacity.

Some schoolars [1,9,15] have evaluated the food security and dietary diversity in families. Still, there is a dearth of useful data about the assessment of household vulnerability in Nigeria. This study was therefore intended to examine the level of vulnerability among Nigerian groundnut value chain actors

MATERIALS AND METHODS

The study was conducted in the three agroecological zones of Nigeria. Northern Nigeria is located between Latitudes 9° and 14° North and Longitudes 3° and 15° East.

Sampling Procedure and Sample Size of the Groundnut Value Chain Actors

Groundnut Producers

The study used a multi-stage sampling procedure to select three agroecological zones for groundnut production in Nigeria. Thirty-one Local Government Areas (LGAs) were selected, and ninety-three villages/communities were randomly selected. Power analysis software was used to determine the sample size of 14 groundnut farmers in each village/community, resulting in 1,302 farmers randomly selected and interviewed.

Groundnut Marketers and Processors

The study also used a multi-stage sampling procedure to select groundnut marketers and processors in Nigeria, stratifying the area into three agroecological zones and purposively selecting major markets and processors based on market involvement. A total of 409 marketers and 316 processors were randomly selected and interviewed across three agroecological zones.

Data Collection

A field survey was conducted in the northern part of Nigeria during the 2020 and 2021 agricultural seasons using a structured questionnaire and interview schedule. The data collected included household characteristics, production, processing, marketing, income sources, expenditure on food and non-food items, durable and non-durable assets, and credit facilities.

Analytical Techniques

Multidimensional vulnerability index include: Foster-Greer Thoerbecke Poverty Indices. The Foster Greer-Thoerbecke (FGT) poverty indices were utilized to estimate the vulnerability of value chain actors in agroecological zones, as adapted by [21] Where, Z=poverty line; $x_j = \text{censored per capita income}$; N=sample size; q=nnumber of households below the poverty line;α =degree of aversion. Where a=0=$P_a = P_{0=\frac{q}{N}}$ represents the headcount ratio, which is also known as poverty incidence. when $\alpha = 1$, $P_a = P_1$ which

is the poverty gap with $\frac{z-x_j^*}{z}$ being the income gap ratio of household j from the poverty line. where $\alpha = 2, P_a = P_2$ which is the squared poverty gap also known as the poverty severity. Note three poverty lines were considered for different actors in this analysis.

Calorie Proxy Indicator

Access to food was estimated in four dimensions as adopted by [1]. The caloric proxy calculates the calories per capita based on food produced and consumed by a household. The quantity of food produced and purchased for consumption in local measures was first converted to kilograms and further to calories and then divided by the household size adjusted for adult equivalence using the equivalent male adult scale weight. To obtain the calories consumed per day per household, the result was further divided by 365 days and then compared with the standard of 2400 kcal according to the Food and Agriculture Organization (FAO). The calorie equivalent of commonly eaten foods in Nigeria was used to estimate the calorie intake of households. The households whose daily per capita calorie intake was up to 2400 kcal could be regarded as food secure while those below 2400 kcal could be regarded as food insecure as adopted by [21].

Accessibility Index

Accessibility index in equation 2 is probably the most difficult dimension of food security to analyze as it intrinsically includes very different aspects: economic, physical, and social access all together shape the possibility for a person to access food. The variables selected to analyze economic access for the households as adopted by [1], include prices of food consumed, land size under cultivation, output from groundnut, sales from groundnut output, and income from primary occupation**.** Individual indices for each of the variables were first computed by the general formula:

$$\boldsymbol{Index = \frac{Actual\ X_1\ Value - minimium X_1\ \ Value}{maximium\ X_1\ Value - minimium X_1\ _{Value}}} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \boldsymbol{(2)}$$

Minimum-Maximum normalizes the variables to have an identical range (0,100) by subtracting the minimum value and dividing by the range of the indicator values.

The indices was ranged and classified into high, medium, and poor accessibility.

$$\boldsymbol{Accessibility\ Index = PFC\ index + LSC\ index + OG\ index + SGO\ index + IPO\ index} \quad \boldsymbol{(3)}$$

Where; PFC = price of food consumed; LSC = land size under cultivation; OG = utput from groundnut; SGO = sales from groundnut output and IPO = iincome from primary occupation.

Food Consumption Score (FCS)

The food consumption score for each household was computed by summing up the products of the consumption frequency for each food group and its corresponding assigned nutritional weight as adopted by [1]. As such, the FCS is a composite measure of dietary diversity, food frequency, and relative nutritional importance of different food groups. Data on these parameters were collected for each household using a 7-day recall. The food frequency was measured as the number of days a particular food group was consumed in the seven days. [1] shows the food groups and weighting applied to each based on their respective nutritional values. The FCS for each household was computed by summing up the products of the consumption frequency for each food group and its corresponding weight. Household FCSs equal to and below 28 were categorized as poor, those between 29 and 42 as borderline, and the ones above 42 as acceptable in line with study of [1]. The score was calculated as follows:

FCS=WcerealsDcereals+WlegumesDlegumes+WvegetablesDvegetable+WfruitsDfruits+ WanimalproteinDanimalprotein+ WdairyproductDdiaryproducts+WsugarDsugar (4)
Where W= weight attributed to the food group; D = nnumber of days each food group is consumed. [32], shows the types of foods taken into account, their corresponding food groups, and the weight attributed to each group.

RESEARCH RESULTS

Vulnerability Status of Groundnut Actors in the Chain System

Groundnut Farmers

The results from Table 1 provide insights into the poverty level, a proxy to vulnerability degree, among groundnut farmers in different agroecological regions. The pooled mean per capita household income (MPCHI) of ₦400,378.40 ($1052.9) was used across the three agroecological zones to obtained 2/3 and 1/3 vulnerability thresholds to delineates households into non-vulnerable, moderately vulnerable, and very vulnerable categories based on their annual mean per capita income.

The poverty gap index illustrates the income shortfall for poor households to reach the poverty line. Approximately 25.9, 23.4, and 28.6 % of MPCHI was needed to uplift poor groundnut farmers in the Sahel, Sudan, and Guinea Savanna regions, respectively to the poverty line. This translates to additional MPCHI requirements of ₦79,541.83 ($209.18), ₦83,545.62 ($219.71), and ₦87,015.56 ($228.84), respectively per capita. The poverty severity index reflects the depth of poverty among the poorest households. The higher the index, the more severe the vulnerability. This suggests that a significant portion of groundnut farmers in these regions face severe poverty conditions. The result is comparable to the studies by [1,37].

Table 1.

Poverty status of groundnut actors in the chain system

	Poverty threshold line (%)			FGT poverty indices			MPCHI ($)		
	Non-poor	Moderate poor	Very poor	Incidence (P_0)	Depth (P_1)	Severity (P_2)	MPCHI	2/3* (MPCH)	1/3* (MPCHI)
Farmers									
Sahel	11.8	49.28	28.92	0.4619	0.2586	0.1560	1052.90	701.93	350.96
Sudan	15.4	53.64	30.96	0.4823	0.2342	0.2132	1052.90	701.93	350.96
Guinea	18.6	54.23	27.17	0.4901	0.2861	0.2350	1052.90	701.93	350.96
Processors									
Sahel	76.76	23.24	na	0.452	0141	0.0001	2235.31	1490.20	745.10
Sudan	78.31	21.69	na	0.382	0.182	0.0001	2235.31	1490.20	745.10
Guinea	79.61	20.39	na	0.462	0.112	0.0001	2235.31	1490.20	745.10
Marketers									
Sahel	32.18	54.93	12.89	0.382	0.299	0.224	842.99	404.21	280.99
Sudan	35.14	53.64	11.22	0.391	0.313	0.256	842.99	404.21	280.99
Guinea	38.61	48.23	13.16	0.321	0.326	0.221	842.99	404.21	280.99

Sources: Authors' s compilation based on field survey.
Note: MPCHI denote mean per capita household income, United State Dollar (USD) is equivalent to ₦380.2556 as at the time of the data collection in 2020/2021.

The findings from Table 1 shed light on the vulnerability patterns among groundnut processors and marketers in the three agroecological zones. The results of processors indicate that a significant majority of groundnut processors—approximately 76.76, 78.31, and 79.61 % in the Sahel, Sudan, and Guinea Savanna regions, respectively were classified

as non-poor. The groundnut marketers revealed a relative poverty line of ₦153,705.90 ($404.22) was established from farm and non-farm income of the marketer's household. Thus, the result of the poverty incidence indicates that about 38.2, 39.1, and 32.1 % in the variability of poverty of households of groundnut marketers within the poor in the Sahel, Sudan, and Guinea Savanna, respectively.

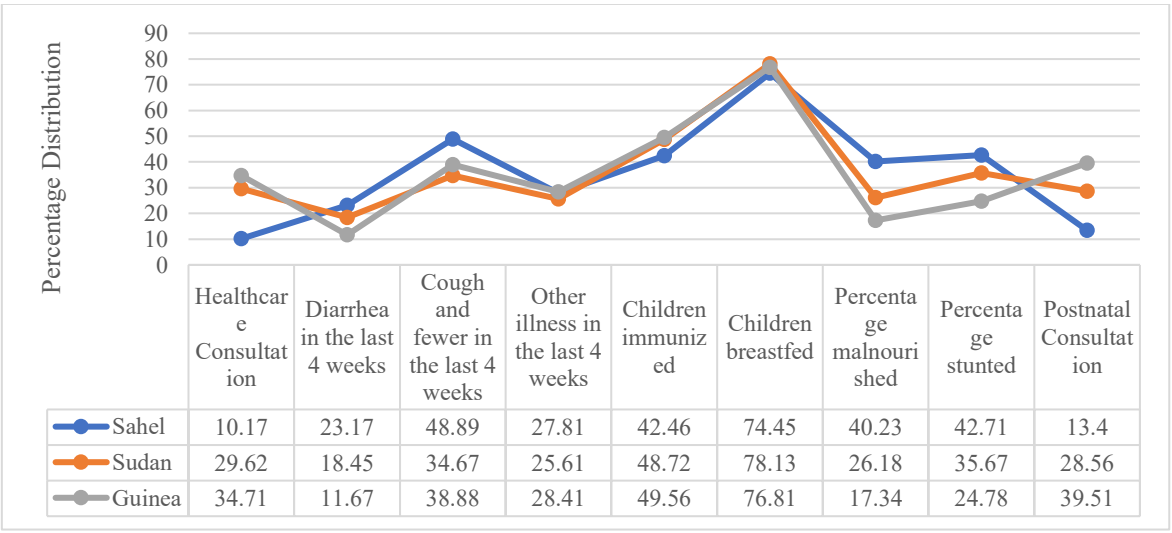
This suggests considerable variability in poverty levels among groundnut processors across different regions. While a substantial portion of processors fall outside the poverty threshold, a significant proportion still grapples with poverty. The implications of these findings underscore the need for targeted interventions to address poverty among groundnut processors, particularly in regions with higher poverty incidence rates.

The poverty gap results revealed that the poverty gap index for the poor marketers was 0.2986, 0.3132, and 0.326 which simply means that about 29.8, 31.3, and 32.6 % of the total incomes were required to bring individuals within the poor households up to the poverty line of ₦106,853.0. The implication is that groundnut marketers among the poor marketer's need about 29.8 31.3 and 32.6% which translates into ₦45,804.36 ($120.46), ₦48,109.95 ($126.52), and ₦50,108.12 ($131.77) for Sahel, Sudan, and Guinea Savanna respectively annually in addition to their mean per capita annual farm income to attain the poverty line.

Level of Variability using Health Indicator

Groundnut Farmers

The health indicator of vulnerability measure reveals important insights into the healthcare utilization and health status of groundnut farmers across different regions. Figure 1 shows a small percentage of groundnut farmers, comprising 10.17%, 29.62%, and 34.71% in the Sahel, Sudan, and Guinea Savanna, respectively sought consultation from health providers. However, there were variations in healthcare utilization among different agroecology. Regarding child health, about 40.23%, 26.18%, and 17.34% of farmers in the Sahel, Sudan, and Guinea Savanna, respectively observed signs of malnutrition in their children. Moreover, 13.4, 28.56, and 39.51 % of groundnut farmers in the Sahel, Sudan, and Guinea Savanna, respectively accessed postnatal consultation. These findings imply that there are disparities in health care utilization based on socioeconomic status across the three agroecology. These findings highlight the healthcare vulnerabilities faced by groundnut farmers, particularly in accessing essential healthcare services and addressing child malnutrition.



	Healthcare Consultation	Diarrhea in the last 4 weeks	Cough and fewer in the last 4 weeks	Other illness in the last 4 weeks	Children immunized	Children breastfed	Percentage malnourished	Percentage stunted	Postnatal Consultation
Sahel	10.17	23.17	48.89	27.81	42.46	74.45	40.23	42.71	13.4
Sudan	29.62	18.45	34.67	25.61	48.72	78.13	26.18	35.67	28.56
Guinea	34.71	11.67	38.88	28.41	49.56	76.81	17.34	24.78	39.51

Figure 1. Health indicator of groundnut farmers across the agroecology

Sources: Authors' compilation based on field survey

Groundnut Processors

The health indicator of vulnerability measure in Figure 2 sheds light on the healthcare utilization and health status of groundnut processors across different regions. A significant proportion of groundnut processors, comprising 44.67%, 54.57%, and 58.61% in the Sahel, Sudan, and Guinea Savanna respectively, sought consultation from health providers. These findings show the healthcare vulnerabilities faced by groundnut processors, particularly in accessing essential healthcare services and addressing child malnutrition. Efforts to improve healthcare access, promote child immunization, and address malnutrition issues are crucial for enhancing the overall well-being and resilience of groundnut processing communities in these regions.

Groundnut Marketers

Figure 3 shows the healthcare challenges and vulnerabilities faced by groundnut marketers, particularly in accessing essential healthcare services. Results show that a small percentage of groundnut marketers, comprising 29.61%, 28.67%, and 38.88% in the Sahel, Sudan, and Guinea Savanna, respectively, sought consultation from health providers. Only a small fraction (less than 15%) of the entire population of groundnut marketers reported experiencing diarrhoea, cough, and fever in the last 4 weeks. These findings are consistent with prior research conducted by [2], which have highlighted challenges related to malnutrition and limited access to healthcare services among rural populations, particularly in agricultural communities. Moreover, the vulnerability measure indicates that only a small fraction of groundnut marketers, less than 15%, reported experiencing common ailments such as diarrhoea, cough, and fever in the preceding four weeks. This suggests that while marketers may have relatively better health outcomes compared to farmers and processors, there is still room for improvement in healthcare utilization and family health practices.

Access to Water Quality as a Measure of Vulnerability

The results regarding water access among groundnut producers and groundnut processors in Table 2 shed light on their vulnerability to water-related health issues across different regions. Less than 20% of groundnut producers across the agroecology have access to an in-house household water connection, providing above 40 litres of water with low chances of diarrhoea, at below 1%. However, the majority, comprising 64.8%, 56.2%, and 42.5% of groundnut producers, rely on unprotected village hand pumps or wells located at 0.6 to 1 km.

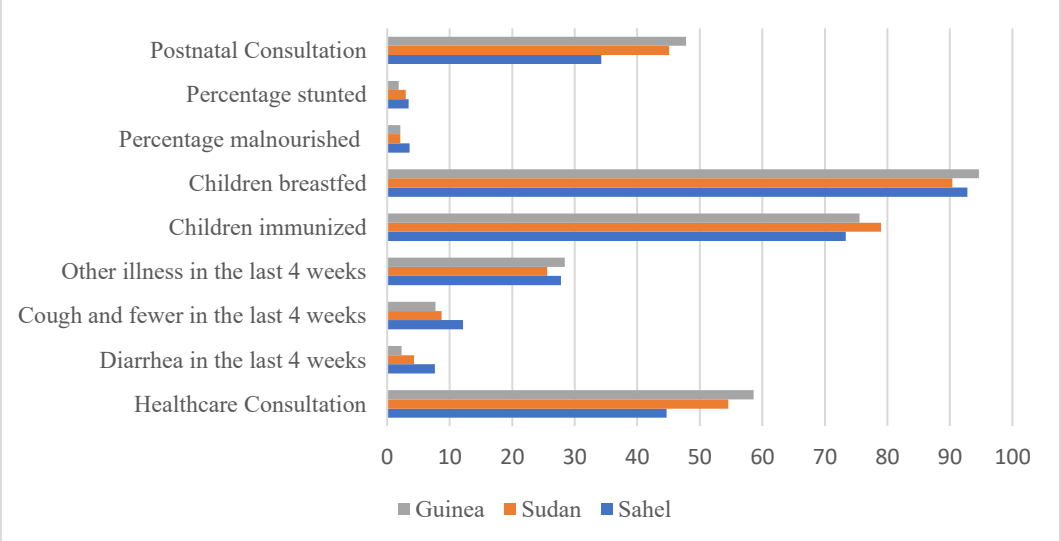


Figure 2. Health Indicator of Groundnut Processor across the Agroecology

Sources: Authors' compilation based on field survey

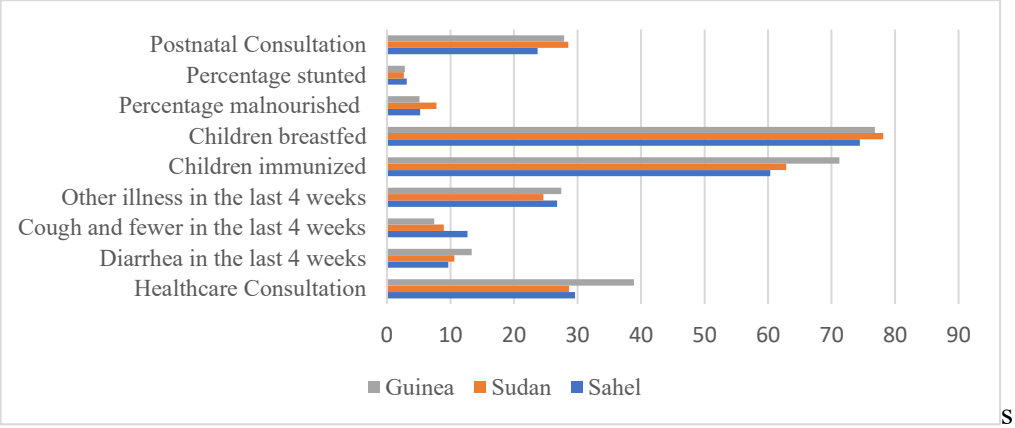


Figure 3. Health Indicator of Groundnut Marketers across the Agroecology

Sources: Authors' compilation based on field survey

Additionally, a larger proportion, comprising 64.3%, 71.5%, and 79.6% of groundnut processors, have access to protected village hand pumps or wells located at 0.6 to 1 km. However, this access is associated with a 5 to 10% impact on diarrhoea. Less than one-third of groundnut marketers across the agroecology have access to an in-house household water connection, providing above 40 litres of water with a low chance of diarrhoea, below 1%. This arrangement is associated with a 5 to 10% impact on the incidence of diarrhoea. These findings highlight significant disparities in water access and quality among groundnut producers.

Table 2.

Vulnerability (water quality) of the actors across the agro-ecologies

Groundnut actors	Accessibility (km)	Quality (litre)	Impact (%)	Sahel	Sudan	Guinea
Availability criterion						
Farmers						
Household connection	In house	> 40l	< 1% diarrhea	3.6	14.7	19.9
Protected village hand pump or well (PVHP/W)	0.5km	30-40l	1-5	25.2	22.8	49.9
Unprotected village hand pump or well (UVHP/W)	0.6-1km	20-30l	5-10	64.8	56.2	42.5
Stream	1-3km	10-20l	10-20	54	43	12
Pond	>3km	< 10l	> 20	13	18	24
Processors						
Household connection	In house	> 40l	< 1% d	32	46.3	45.9
PVHP/W	0.5km	30-40l	1-5	64.3	71.5	79.6
UVHP/W	0.6-1km	20-30l	5-10	5.7	3.4	2.8
Stream	1-3km	10-20l	10-20	1.2	0	0
Pond	>3km	< 10l	>20	0	0	0
Marketers						
Household connection	In house	> 40l	< 1% d	25.1	26.9	30.3
PVHP/W	0.5km	30-40l	1-5	66.6	74.8	81.6
UVHP/W	0.6-1km	20-30l	5-10	4.8	2.9	1.6
Stream	1-3km	10-20l	10-20	1.2	2.1	2.4
Pond	> 3km	< 10l	> 20	0	0	0

Sources: Authors' compilation based on field survey

The reliance on unprotected village water sources increases the risk of waterborne diseases such as diarrhoea. Improving access to safe and clean water infrastructure, especially for those relying on village hand pumps or wells, is crucial for mitigating health vulnerabilities among groundnut producers. However, a larger proportion, comprising 66.6%, 74.8%, and 81.6% of groundnut marketers, have access to protected village hand pumps or wells located at 0.6 to 1 km. The data suggests that the quality of water sources varies based on their distance from farmers' residences which are consistent with prior research conducted by [20], which have highlighted challenges related to malnutrition and limited access to healthcare services among rural populations, particularly in agricultural communities. These findings show uneven distribution of water access and quality among groundnut marketers.

Availability of food resources

Calorie proxy was used as an indicator for food availability, the result in Table 3 shows that in the Sahel, Sudan, and Guinea Savanna regions, approximately 60, 59.7, and 41.3 % of groundnut actors, respectively were found to have very poor food availability to calories, ranging from 800 to 1600 Kilocalories per kilogram (Kcal/Kg/Wk) compared to minimum of 24000Kcal/kg/day. This indicates that more than half of the groundnut farming population in these regions lacks sufficient and nutritious food.

The average calorie intake was 1960 Kcal/kg for the Sahel, 2170 Kcal/kg for Sudan, and 2285 Kcal/kg for Guinea, representing low calorie levels among groundnut farmers in the Sahel and Sudan. Poor accessibility in the study areas may stem from various factors, including price fluctuations for consumable items, inputs, and outputs, as well as stagnant income growth. This finding is at variance with [26], whose results showed that the average daily per capita calorie intake of the households was about 3175 calories in Kaduna State.

Table 3.

Vulnerability of the actors across the agro-ecologies based on access to food

Access to food classification	Range	Sahel	Sudan	Guinea
Availability using Calories Consumed				
Very poor calories	800-1600	67	59.7	41.3
Poor	160-2200	31.3	25.3	16.2
High	2201-3200	1.7	10.0	26.4
Very high	3200-4000	0	5.0	16.1
Average Kcal		1960	2170	2285
Accessibility Index Classification				
Poor accessibility	0.820-3.310	51	15.3	48.3
Medium	3.311-4.440	40.7	48.3	40.2
High	4.441-5.550	7.3	22.7	10.5
Very high	5.551-11.576	1	13.7	8
Average		2.143	3.986	3.675
Food Consumption Score Classification				
Poor consumption	2.090-24.700	59.4	29.6	57.1
Borderline	24.701-47.300	31.7	58.3	31.4
Acceptable	Above 47.300	8.9	12.1	11.5
Average		23.56	30.67	28.45

Sources: Authors' compilation based on field survey

Accessibility to food resources

The average accessibility index was 2.143 for the Sahel, 3.986 for Sudan, and 3.675 for Guinea Savanna, representing poor accessibility for groundnut farmers in the Sahel and medium accessibility for groundnut farmers in Sudan and Guinea. Food insecurity arises not

only from insufficient food supply but also from limited purchasing power and access for low-income and impoverished households, as noted by [22].

Food consumption score (FCS)

The FCS was utilized to evaluate the food utilization of farming households involved in groundnut production. The classification of groundnut farming households based on their food consumption groups derived from the food consumption assessment. The results in Table 3 indicate that 59.4%, 29.6%, and 57.1% of groundnut farmers in the Sahel, Sudan, and Guinea Savanna regions respectively had poor food consumption. Additionally, 31.7, 58.3, and 31.4% of groundnut farmers in the Sahel, Sudan, and Guinea Savanna, respectively were classified as having borderline consumption as shown in Table 3. These findings suggest significant challenges in achieving adequate and balanced nutrition among groundnut farming households in the three Savanna regions. Addressing food consumption gaps and promoting diversified diets rich in essential nutrients are crucial steps toward improving the nutritional status and well-being of groundnut farming communities.

CONCLUSIONS

The groundnut value chain actors experienced different degree of vulnerability as indicators across the three regions established that these value chain actors are proned or exhibited diverse various degree of vulnerability. The study underscores the need for targeted interventions in all the domain of poverty indicators to address and reduce vulnerability among groundnut value chain actors. These include but not limited to interventions by government, NGOs and community-based programs such as access to improve seed and farm inputs to enhance their productivity; access to clean water infrastructure by sinking well and boreholes with adequate distance, mitigate health vulnerabilities by providing social amenities like affordable health care facilities such as primary health care centres in rural communities and enhance their calories balance intake by educating the rural populace on promoting diversified diets rich in essential nutrients and stabilizing food prices, enhancing income opportunities, and resolving conflicts..

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