Food Security and Vulnerability in Drought Prone Northern State of Nigeria: An Assessment of Three Communities in Northwestern Nigeria

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FOOD SECURITY AND VULNERABILITY IN DROUGHT PRONE NORTHERN STATE OF NIGERIA: AN ASSESSMENT OF THREE COMMUNITIES IN NORTH WESTERN NIGERIA

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Abstract

The food security situation in drought prone areas of Sokoto, Kebbi and Zamfara States were assessed in this paper. The primary data obtained from the interviewed households was based on a designed structured questionnaire and random selection of the households. Descriptive statistics was used to analysed the socio-economic and demographic data of the households, while regression analysis was used to determine the food security and insecurity status of the households by using Global and Nigerian Bench marks provided by FAO. The results of the study have shown that households size, level of education as well as per capita income have significant effect on status of food security in the study areas. Recommendations were also offered towards achieving food security in the affected areas for national development.

1.0   Introduction

Food security refers to the condition, in which all people, at all times, have physical, social, and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life (FAO/WHO 1992; FAO 1996). Food availability, stability of supplies and food access are related determinants of food security.

At the household level, food security implies an adequate access to food over time. This is possible when there is adequate food availability to the household, and an adequate income capacity for the purchase of the available food. Stability of food implies that the food availability is not affected by any shocks or risks affecting food production at all times. Availability of food, stability of food supplies and access are therefore three essential determinants of food security. Physical access implies food availability or food supply to the household, as there might be food available at the national level which however may not trickle down to the household level.

A number of factors such as income, educational level, and household sizes are known to affect household food security, as they directly affect economic access and the sustenance of such access. Lack of food security, referred to as food insecurity, hunger, and poverty are closely linked. For farm households in rural areas, food availability means ensuring that sufficient food is available for them through their own production or purchase from markets. However, due to lack of adequate storage facilities and pressing needs, they mostly end up selling excess produce during the harvesting period, and sometimes rely on market purchases during the hungry season, thereby creating a situation of food insecurity for most rural farm producers and households. Not only does food insecurity in itself have deleterious effects on households and individuals, but efforts at achieving food security may also exact a heavy toll on households if they must spend most of their income on obtaining food.

The economic development of a nation is dependent on its factor endowment. This includes the non-human and human resources. The productive capacity of the human resources is however a function of how well fed they are. Food problem, with regards to quality and quantity, is one of the characteristics of developing countries like Nigeria. According to Okunmadewa 2001 (in Omonona etal, 2007), the concern for food security and nutritional well-being in an economy is predicated by role of human element in economic development. This shows why at national level food is of economic and political significant especially in issues relating to national security, maintaining political stability and ensuring peace and stability among the populace. The government, through the formulation and implementation of appropriate policies by its specified agencies ensures the availability, adequacy and proper utilization of food in the country. The levels of nutrient requirement have been determined by the world Health Organization (WHO) and the Food and Agricultural Organization (FAO). The basic minimum requirement figure has been found to be 65 grammes of protein and 2500 kcal of energy per capita intake of which if consumed otherwise, leads to a state of malnutrition.

1.1   Concept of Food Security

The concept of food security has evolved during the 1990s far beyond a traditional focus on the supply of food at the national level. According to World Bank (1986), food security was defined as access by all people at all times to enough food for an active and healthy life. The committee on world food security defined it as physical and economic access to adequate food by all household members without undue risk of losing the access. However, the definition adopted by the countries attending the world food summit of 1996, and reconfirmed in 2002, accepts the USAID's concept which has three pillars of food security which include: food availability, food access and food utilization.

Food availability refers to sufficient quantities of appropriate, necessary types of food from domestic production, commercial imports, and other sources, that are consistently available to individuals or are in reasonable proximity to them. In this context, availability refers to the physical existence of food, from own production or in the markets. National level food availability is a combination of domestic food production, commercial food imports, food aid, and domestic food stocks, as well as the underlying determinants of all of these factors Gross et al. 2000 (in Akinyele, 2009).

Stability of food supplies implies that households should not risk losing access to food as a consequence of sudden shocks (climatic crisis) or cyclical events (e.g. seasonal food insecurity). Food stability at the household level is thus critical to food security.

Access to food is defined by an individual's capacity (i.e., incomes or other resources) to purchase or barter to obtain levels of appropriate foods needed to maintain consumption of an adequate diet and nutritional level. Food access also is a function of the physical, social, and policy environment which determine how effectively households are able to use their resources to meet their food security objectives. Access is therefore ensured when all households and all individuals within those households have sufficient resources to obtain appropriate foods for a nutritious diet (Riely et al.1999 in Akinyele 2009). The level of resources (capital, labor, knowledge, and others) at the disposal of households and individuals to a large extent determines their economic access to required foods, in addition to the prevailing market prices of the food commodities. The ability of most households in rural and urban Nigeria to generate a sufficient income, which together with own production, can be used to meet food needs is however undermined as a result of high levels of poverty.

Amaza etal (2009), in a study of changes in household food security and poverty status in PROSAB Project area of Southern Borno State of Nigeria, estimated household food security status as a function of household characteristics, crop production, and participation in PROSAB activities. Olayemi (1998), isolated determinants of household food security into supply-side factors, demand-side factors and stability of access to food which include household food and non-food production variability; household economic assets; household income variability; quality of human capital within the households; degree of producer and consumer price variability; and household food storage and inventory practices. Dirorimwe (1998), while carrying out a participatory development of a household food security and nutrition improvement programme in Kano State, listed the indicators used by local communities in their classification of food insecure households to include size of farmland owned by the household, the period when household members start to sell labour, daily meal frequency, sale of livestock and other assets in order to buy food, resort to borrowing and begging of food.

Furthermore, Kohoi et al (2005), revealed in their own study that the significant determinants of food security in the Mwingi district of Kenya were participation of households in the food-for-work program, marital status of the household heads, and their educational level. In a study of vulnerability to food insecurity of rural households from Nicaragua, Capaldo et al (2010), estimated daily per capita kilocalorie consumption as a function of several variables representing the households demographic and social characteristics, asset holdings, liquidity constraints, access to infrastructure, occurrence of shocks and geographic location.

1.2   Concept of Vulnerability to Food Security

Vulnerability has been described as exposure to risks, shocks and stress and difficulty in coping with them. It can also be the factors that influence exposure to food insecurity and a household's predisposition to the consequences. Based on the framework of vulnerability

developed by Lovendal and Knowles (2005), current socio-economic characteristics and exposure to risks determine household's future characteristics and their risk-management capacity. At every point in time households' current food security status is affected by their past status and affects their future status. While present characteristics are known by households and determine households' current food security status, between the present and future, however, risks and shocks manifest and determine the future food security status depending on households risk management abilities. The global benchmark on food insecure households is based on 2500 kilocalorie consumption per person per day, while the National (Nigerian benchmark) is based on 2160 kilocalorie consumption per person per day (FAO, 2002).

1.3   Poverty Situation

According to the Central Bank of Nigeria, about 70% of the Nigeria's population lives in poverty with incomes of less than one dollar a day. Furthermore, the highest proportion of the poor people are found in the Northwest States of Nigeria (C.B.N, 2010), Furthermore, Table 1 below provides information on human poverty index in the northwestern states of Nigeria (which includes the three States of Kebbi, Sokoto and Zamfara) according to UNDP human development report for Nigeria 2008-2009.

Table 1: Human Poverty Index by States for North-West Zone

State	Human Poverty Index
Kebbi	*50.2*
Sokoto	*40.5*
Zamfara	*42.6*
Jigawa	48.4
Kano	43.0
Kaduna	34.3
Katsina	49.9

Source: Human Development Report, Nigeria 2008 – 2009 (UNDP)

Taking into cognizance the level of development in the area under study, increased productivity (eg. food production) will no doubt trigger economic development through employment generation which in turn will raise per capita income of the households.

2.0   Research Methodology

2.1   Study Area

The study was conducted in three communities namely Bela in Argungu Local Government of Kebbi State, Basanta in Illela Local Government of Sokoto State and Rakuma in Bakura Local Government of Zamfara State respectively. These areas were selected considering the fact that they fall under the drought prone zone. The study was carried out in the month of November 2010 immediately after harvest.

2.2   Sampling and Data Collection

In each of the three selected communities, thirty (30) households were randomly selected. Designed structured questionnaire was used to interview and collect primary data from each household unit.

2.3   Method of Data Analysis

Two levels of data analysis were applied in this research, descriptive analysis and regression. The descriptive analysis focused on demographic and socio economic characteristics of the households while regression analysis was used to determine the categories of food secure, food insecure and vulnerable households based on global and national bench marks respectively.

2.4   Presentation and Discussion of Analysed Data

2.4.1   Household Demographic and Socio-economic Characteristics

These characteristics which include gender, age, occupation literacy, size and landholding of households, may be a factor which determine food security situation of households as they indicate quantity of food demanded by the respective households.

Table 2: Gender of Household Head

Sex of the household	Kebbi State (Bela)		Sokoto State(Basanta)		Zamfara State (Rakuma)	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Male	29	96.7	29	96.7	30	100
Female	1	3.3	1	3.3	0	0
Total	30	100	30	100	30	100

Source: Fieldwork, 2010

96.7% of the household heads interviewed were males and 3.3% were females in Kebbi and Sokoto States. While all the households (100%) interviewed were males in Zamfara State. This has clearly explained the dominance of male headed households in the study area.

In Kebbi and Sokoto States, the dominant active age group is 41-50 years represented by 33.4% of the households next to it is age range of 31 – 40 years represented by 20% of the household heads. In Zamfara State, the active age group is 41- 50 years and 51- 60 years represented by 30% of the interviewed households and also another active age group is 31-40 years resented by 23.3% of the households.

Table 3: Age of Household Head

Age of the household (in years)	Kebbi State (Bela)		Sokoto State (Basanta)		Zamfara State (Rakuma)	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
20-30 years	4	13.3	4	13.3	7	6.7
31-40 years	6	20	6	20	2	23.3
41-50 years	10	33.4	10	33.4	9	30
51-60 years	3	10	3	10	9	30
61-70 years	4	13.3	4	13.3	1	3.3
Above 71 years	3	10	3	10	2	6.7
Total	30	100	30	100	30	100

Source: Field work, 2010

Table 4: Household Size

Household Size (in persons)	Kebbi State (Bela)		Sokoto State (Basanta)		Zamfara State (Rakuma)	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
1-5 persons	4	13.3	4	13.3	6	20
6-10 persons	13	43.3	18	60	10	33.3
11-15persons	7	23.3	6	20	6	20
16-20persons	4	13.3	0	0	4	13.3
Above 21 persons	2	6.6	2	6.6	4	13.3
Total	30	100	30	100	30	100

Source: Fieldwork, 2010

Majority (43.3%) of the household's size in Kebbi State ranged from 6-10 members and 23.3% household have family size ranging from 11-15. In Sokoto State, majority of the households (60%) have family size of 6-10 members, 20% have 11-15 members.

In Zamfara State, 33.3% of the households have family size of 6-10 members, while household size range of 1-5 members and 11-15 members is represented by 20% of the households. It could be seen that household's size range of 6-10 members is dominant in the study areas.

Table 5: Educational Level of Household Head

Educational level of household head	Kebbi State (Bela)		Sokoto State (Basanta)		Zamfara State (Rakuma)	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Illiterate	0	0	2	6.7	0	0
Koranic	30	100	25	83.4	29	96.7
Primary	0	0	1	3.3	0	0
Secondary	0	0	1	3.3	1	3.3
Post Secondary	0	0	1	3.3	0	0
Total	30	100	30	100	30	100

Source: Fieldwork, 2010

In Kebbi State, all the interviewed household heads (100%) attended Koranic education. In Sokoto State, 83.3% of the household heads attended Koranic education. In Zamfara State, majority of the households interviewed (97.6%) attended Koranic schools. It was clear that majority of the households in the study areas attended koranic schools, this in turn impact negatively in adoption of improved technologies and practices which are mainly based on non Koranic education.

Table 6: Occupation of Households

Occupation of the household head	Kebbi State (Bela)		Sokoto State (Basanta)		Zamfara State (Rakuma)	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Farming	29	96.7	30	100	30	100
Others	1	3.3	0	0	0	0
Total	30	100	30	100	30	100

Source: Fieldwork, 2010

The major occupation the household heads in Kebbi State is farming (96.7%) In Sokoto and Zamfara States, all the households interviewed (100%) are farmers with no other income generation activity engaged.

Table 7: Households landholding (Size)

Landholding (in Hectares)	Kebbi State (Bela)		Sokoto State (Basanta)		Zamfara State (Rakuma)	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
1-5 ha	4	13.3	4	13.3	6	20
6-10 ha	13	43.3	18	60	10	33.3
11-15 ha	7	23.3	6	20	6	20
16-20 ha	4	13.3	0	0	4	13.3
Above 20 ha	2	6.7	2	6.7	4	13.3
Total	30	100	30	100	30	100

Source: Fieldwork, 2010

In Kebbi State majority of the households (43.3%) owned an average of 6-10 hectares, 23.3% owned 11-15 hectares In Sokoto State, Majority (60%) of the interviewed households owned an average of 6-10 hectares 20% owned 11-15 hectares.

In Zamfara State, the majority (33.3%) of the respondents owned 6-10 ha of land while 20% of the owned an average of 1-5 hectares and 11-15 hectares of land. It was found out that the landholding range of 6-10 hectares is commonest across the three States, also land holding range of 11-15 hectares is significant. The size of landholding is a factor that provides promising opportunities for mechanized agriculture and high output.

Table 8: Household Income and Per Capita Food Expenditure

Income/ Expendiure	Kebbi State (Bela)	Sokoto State (Basanta)	Zamfara State (Rakuma)
Household Annual Income (₦)	217,558.36	125,489.59	273,086.30
Household Annual Food Expenditure (₦)	45,431.00	58,320.00	44,335.00
Proportion of income expended on food (%)	21	46.5	16.2

Source: Fieldwork, 2010

The frequency of food consumption is influenced by the availability of disposable farm income and the proportion of own farm income and the proportion of own farm products consumed. The larger the households size the higher is the rate of expenditure on food. Analysis has shown that there is variation between the three communities in the study area regarding food expenditure proportion. Sokoto State has the highest proportion of 46.5% being proportion of annual income expenditure on food; Kebbi State has 21% while Zamfara State has the lowest proportion on expenditure on food with 16.2%.

Table 9: Food Security Status of the House Holds (Using Global Benchmark of 2500kcal/person/day)

Food Security Status	Kebbi State (Bela)		Sokoto State (Basanta)		Zamfara State (Rakuma)	
	Frequency	percent	Frequency	percent	Frequency	Percent
Food Secure	11	36.7	13	43.3	17	56.7
Food Insecure	19	63.3	17	56.7	13	33.3
Total	30	100	30	100	30	100

Source: Fieldwork, 2010

About 36.7% of the households in Kebbi State are food secured for a period of up to nine (9) months, in Sokoto State 43.3% are food secured up to nine (9) months and in Zamfara State 56.7% are food secured up to nine (9) months.

Table 10: Food Security Status of the House Holds (Using Nigerian Benchmark of 2160kcal/person/day)

Food Security Status	Kebbi State (Bela)		Sokoto State (Basanta)		Zamfara State (Rakuma)	
	Frequency	percent	Frequency	percent	Frequency	Percent
Food Secure	27	90	27	90	22	73.3
Food Insecure	3	10	3	10	8	26.7
Total	30	100	30	100	30	100

Source: Fieldwork, 2010

Using the Nigerian benchmark which has a lower kilocalorie consumption level, more households were food secured.

4.0   REGRESSION RESULTS FOR HOUSEHOLD INVOLVED IN THE STUDY

4.1   DETERMINANTS OF FOOD SECURITY

Several researchers have recently investigated the determinants of food security in developing countries and particularly in sub-Saharan Africa. Paul Amaza (2009) in a study of changes in household food security and poverty status in PROSAB Project area of Southern Borno State of Nigeria, estimated household food security status as a function of household characteristics, crop production, and participation in PROSAB activities. Another author, Olayemi (1998) isolated determinants of household food security into supply-side factors, demand-side factors and stability of access to food which include household food and non food production variability; household economic assets; household income variability; quality of human capital within the households; degree of producer and consumer price variability; and household food storage and inventory practices. Charity Dirorimwe (1998) while carrying out a participatory development of a household food security and nutrition improvement programme in Kano State, listed the indicators used by local communities in their classification of food insecure households to include size of farmland owned by the household, the period when household members start to sell labour, daily meal frequency, sale of livestock and other assets in order to buy food, resort to borrowing and begging of food. Kohoi et al (2005) revealed in their own study that the significant determinants of food security in the Mwingi district of Kenya were participation of households in the food-for-work program, marital status of the household heads, and their educational level. In a study of vulnerability to food insecurity of rural households from Nicaragua, Jeronim Capaldo et al (2010) estimated daily per capita kilocalorie consumption as a function of several variables representing the households' demographic and social characteristics, asset holdings, liquidity constraints, access to infrastructure, occurrence of shocks and geographic location.

For this study, least square was used in the analysis. In order to achieve the stated objective**s, three models** or regression specifications were specified namely: per capita kilocalorie consumption model; the output model; and the productivity model which are relevant for policy targeting.

4.1.1 REGRESSION RESULTS ON DAILY PER CAPITA KILOCALORIE CONSUMPTION

Using a sample of 90 rural households from the study area, estimate of function of several independent variables including education level of the household heads, duration of own food produced by households, access to irrigation facilities, access to markets, exposure to drought, age of the household heads, household's family sizes, food expenditure per capita of the households and distance of households to the market was carried out. The econometric analysis used in this study helps to identify indicators that directly affect food consumption.

Table 11: Regression results of the model of per capita kilocalorie consumption

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
I. (Constant)	2.836***	.125		22.658	.000
DURATION OF OWN	-.005	.005		-1.069	.288
FOOD	.030***	.011		2.669	.009
PRODUCE	.033*	.017		1.948	.055
EDU. LEVEL HH	.020	.019	-.028	1.040	.302
ACCESS TO Irrigation	-.003	.004	.116	-.646	.520
ACCESS TO MARKETS	.393***	.026	.071	15.172	.000
DROUGHT	-.413***	.028	.043	-14.513	.000
log HH per capita food	-.037	.055	-.018	-.665	.508
expenditure	-.003	.037	.643	-.086	.931
log FAMILY SIZE			-.444		
log AGE			-.019		
log DISTANCE TO THE MARKET			-.002		

a. Dependent Variable: log K/Cal per Capita

****=Significance at 1%

**=Significance at 5%

*=Significance at 10%

In the above regression results as contained in Table 11, the variables were related to household demographic and socio-economic characteristics on descriptive statistics. Duration of own food, access to irrigation and expenditure per capita on food positively contributed to calorie consumption. The implication of this is that households that have easy access to production infrastructure capable of generating additional income are less likely to become more food insecure. Distance to markets positively correlate with food consumption, their impacts were insignificant due to their inadequacy. Drought has a negative impact on the level of food consumption as expected. Adequate information was obtained on it's occurrence, impact, coping mechanisms and management. The negative correlation between household size and food consumption is an indication that households with more members face a significantly bigger variance in their food consumption and have higher probabilities of being food insecure, same goes for distance to the markets which is negatively correlated to food consumption, implying that increased distance from market is linked to a reduction in the level of food consumption.

4.1.2   REGRESSION RESULTS ON THE OUTPUT MODEL

In this analysis, the total farm output of the households was estimated as a function of improved technology adopted, land area cultivated, labour input, level of fertilizer use, amount of improved seeds used and educational level of households.

Table 12: Regression Results of the Farm Output Model

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1. (Constant)	1.149***	.295		3.898	.000
Share of improved	.128	.160		.802	.425
Technology	.409***	.152	.052	2.685	.009
Log Ha of land used (Ha)	.702***	.095	.181	7.398	.000
Log Labour (Naira)	.080	.062	.584	1.296	.198
Log Fertilizer: Value	.224**	.105	.094	2.126	.036
(Naira)	.059	.045	.156	1.312	.193
Log Seeds: Amount (Ha)			.079		
EDU. LEVEL HH					

a. Dependent Variable: Log total output: Cereals (Naira)

****=Significance at 1%

**=Significance at 5%

*=Significance at 10%

The adoption of improved technology relating to human labour positively contribute to higher levels of farm output. In particular, improved technology which is a proxy for the households' ability use improved inputs such as fertilizers and seeds are most critical to increased cereals production. The high positive correlation between labour input and farm output is an indication of very low level of adoption of farm mechanization in the appraised areas. Size of land holding face a significantly smaller variance in food production, given that what accounts for high output is more of intensification rather than expansion in land area. It was observed that fertilizer use as a variable in this estimation was statistically significant.

4.1.3 REGRESSION RESULTS ON CROP PRODUCTIVITY MODEL

This regression analysis was based on estimates as a function of farm labour use per hectare, fertilizer use per hectare, amount of seeds used per hectare, share of improved technology and education level of household heads.

Table 13: Regression Results of the Productivity Model

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
1. (Constant) EDU. LEVEL HH Log Labour/ Ha Log Fertilizer/ Ha Log Amount of seed/ Ha Share of improved Technology	1.561*** .037 .688*** .095 .148 .187	.277 .047 .102 .072 .109 .165	.060 .601 .118 .110 .092	5.630 .797 6.722 1.311 1.357 1.134	.000 .428 .000 .193 .178 .260

a. Dependent Variable: Log Output/ ha

****=Significance at 1%

**=Significance at 5%

*=Significance at 10%

Similar to the output model, share of improved technology adopted as well as the variable relating to human labour per hectare and quantity of seeds used per hectare positively contributed to higher levels of productivity. However, in the case of productivity model, labour input per hectare has the highest positive correlation with the level of productivity followed by share of improved technology and seed rate in that order. As expected also, educational level of the household heads which is a proxy for the level of knowledge of the land, environment and local conditions, skills, experience and industry in the use of resources and in adoption of improved technologies as well as determining the quality of food intake by household members) was positively correlated with crop productivity. This shows that the more educated the households, the better will be the management of farm resources for higher productivity and production and by implication, higher probability of being food secure.

5.0   Conclusions

Analysis of the characteristics of the households in the three appraised communities revealed an active population whose main occupation is agricultural production. There are enough arable lands for crop cultivation in the communities with scope for expansion if provided with the basic inputs and farm implements such as fertilizers, tractors/animal drawn equipment, improved seeds, among others. The communities however, overwhelmingly depend on rain-fed agriculture with no opportunities whatsoever for dry season irrigated farming. There was visible absence of infrastructure in the three appraised communities which greatly contributed to the level of poverty in the area. Credit and market structure are non-existent. There are no adequate health care facilities and predominant source of energy is firewood. Traditional storage facility (rhumbu) is the common storage structure used by the people to preserve their farm produce.

Proximity to markets is quite far and there is absence of activities by Government Agencies, Development Partners and NGOs.

All the three appraised communities share same level of exposure to such risk factors as drought, pests and diseases infestation, incessant bush fire and cyclical price movements or fluctuations. From the statistical analysis, all categories of the households including the food secure households and food insecure households are exposed to vulnerability and capable of falling in and out of food insecurity.

6.0   Recommendations

The following recommendations/suggestions are proposed based on the outcome of the research.

1.   Government should provide basic inputs and farm implements such as fertilizers, tractors/animal drawn equipment, improved seeds, among others in order for households to increase their food production levels.

2.   The communities however overwhelmingly depend on rain-fed agriculture therefore, dry season irrigated farming should be introduced and encouraged.

3.   Micro-credit scheme using single digit interest rate should be provided to the households so that they gain more economic empowerment o boost their livelihood activities.

4.   Government Agencies, Development Partners and NGOs should also come up with meaningful programmes aimed at assisting farmers at household level especially in communities where no interventions have taken place such as the three communities involved in the study.

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