Journal of Sustainable Development in Africa (Volume 19, No.4, 2017)
ISSN: 1520-5509
Clarion University of Pennsylvania, Clarion, Pennsylvania

ASSESSMENT OF HOUSEHOLD FOOD SECURITY AMONG SORGHUM FARMERS UNDER AGRICULTURAL TRANSFORMATION AGENDA IN GOMBE STATE, NIGERIA

SANI, Abubakar Abdullahi; SANNI, Shukurat Adunni; DAMISA, Maiyaki Abdullahi and OLADIMEJI, Yusuf Usman

Department of Agricultural Economics, Faculty of Agriculture/Institute for Agricultural Research (IAR), Ahmadu Bello University, Zaria, Nigeria

ABSTRACT

This paper assesses the sustainability of household food security among sorghum farmers' beneficiaries under Agricultural Transformation Agenda (ATA) in three Local Government Areas in Gombe State, Nigeria. Primary data were collected from 172 sorghum farmers using structured questionnaire. Stochastic frontier production function cost of calorie method and logit regression models were used to analyse the data. The result of food security status of sorghum farmers indicates that majority (81.4%) of farming households were food secured while 18.6% were not food secured. The determinants of food security status of farming households shows that seven variables: household income ($p<0.1$), education (($p<0.1$), farm output ($p<0.01$), extension contact ($p<0.05$), cooperative membership ($p<0.05$), farm size ($p<0.05$) and access to credit ($p<0.05$) significantly influencing food security status of farming households. Apart from ensuring a food security, increased sorghum production provides employment opportunities for the unemployed citizens' most especially rural settlers and in line with the objective of sustainable development goals of improve agriculture systems and raise rural prosperity.

Keywords: Food Security, Extension Education, Transformation Agenda, Stochastic Frontier, Sorghum

INTRODUCTION

Nigeria is an agrarian country with about 70 percent of the population engaged in agriculture production (Ugwu, 2011). Despite the rapidly growing oil industry in Nigeria, agriculture still accounts for 40 percent of the GDP (Ugwu, 2011). The major agricultural commodities, by quantity of production are cassava, yams, maize, sorghum, vegetables, rice, citrus fruit, groundnuts, and sweet potatoes (FAO, 2011). Agricultural productivity is showing signs of recovery, after decades of decline, but it is occurs too slowly to meet the demands of a rapidly growing urban population (IFPRI, 2011). Processing, transportation, infrastructure, and marketing pose additional challenges for food security in Nigeria (IFPRI, 2011).

Food insecurity and malnutrition have profound implications for health and development, and present major obstacles to attaining the Sustainable Development Goals (SDGs). Recently the Nigeria Sustainable Development Goals (SDGs) reported in 2014 revealed that ending extreme poverty including hunger (SDG Goal 1) and achieving health and wellbeing at all ages (Goal 5) in rural area remain a key developmental challenge in the country (Oladimeji *et al*., 2014; Akinmulewo *et al*., 2017). Understanding smallholder farmers in Nigeria, how much they earn, what they eat, as well as broader questions about the role food security plays in health outcomes is crucial to designing sustainable strategies to reduce hunger, poverty, and illness.

The National Economic Transformation Agenda (NETA) introduced by Nigeria government in 2012 was aim to diversify the economy from reliance on oil, assure food security and create jobs, especially for the youths (FMARD, 2012). In line with this, the Federal Ministry of Agriculture and Rural Development (FMARD) has implemented an ATA that will promote agribusiness, attract private sector investment in agriculture, reduce post-harvest losses, add value to local agricultural produce, develop rural infrastructure and enhance access of farmers to financial services and markets (FMARD, 2012).

The transformation action plan is focused on key aspects of Agricultural Value Chain processes. They include the provision and availability of improved inputs (seed and fertilizer), increased productivity and production, as well as the establishment of staple crop processing zones. ATA is expected to address reduction in post-harvest losses, improve linkages with industries as well as improve access to financial services and markets. It targets rural communities' particularly rural women farmers, rural youths and farmers' associations, as well as the improvement of rural Institutions and Infrastructures. ATA sets out to create over 3.5 million jobs from the agricultural sector such as: rice, cassava, sorghum, cocoa and cotton using the value chain approach; with many more jobs to come from other value chains programmes that are under implementation (FMARD, 2012).

Problem Statement

Drought and desertification constitute major problems in Northern part of Nigeria. The drier zone forms an undulating plain at a general elevation not below 450m to 700m. More than half of the region is covered by ferruginous tropical soils which are highly weathered and markedly laterised. The droughts on many occasions were severe to have forced the inhabitants, particularly small farmers' class to leave the nativity temporarily and go in search of a living in other places. Gombe state lies

within this location and literature have shown that the State is challenged and is usually classified as one of the drought prone zone (Abubakar, 2008).

The situation has resulted in a new global trend in the demand for food and there is therefore an urgent need to transform agriculture in Gombe State, to take advantage of this trend in food demand. Considering that sorghum production is fading especially within the small scale farmers, the crop is no longer considered as important as it was before in serving household food demand. For the State to effectively and sustainably increase its shares in Nigeria's agricultural space and harness the market opportunities, the need to re-focus the State agricultural financing policy to develop its agricultural food basket and its commodity value chain to meet the market product demands, has become imperative.(Abubakar, 2008). Measurement of food security at the household level will provide the basis for monitoring future progress of and assessing the impacts of various projects, programmes and policies on the beneficiaries' food security status (Hoddinot, 2001).

Despite the relative importance of sorghum in household food consumption, very little is commercially processed (Rohrbach, 2003). Rough estimates suggest less than 3% of Sub-Saharan Africa's sorghum production is used in the formal food and feed industries. Most of the processed sorghum is used in the production of lager and opaque beers (Rohrbach, 2003). The relative importance of this crop in the rural food systems suggests substantial opportunities should exist for their commercialization.

Based on the foregoing the study attempts to answer the following research questions;

(i) What are the socio-economic characteristics of the households involved in sorghum production under ATA?
(ii) What is the food security status of households among households?
(iii) What are the major determinants of food security among households?

MATERIAL AND METHODS

Study area

Gombe State has a land mass of 20,265km^2, with total population 2,364,284 people as at 2006 population census. The population and farm families were projected to be 3,370,903 and 302,547 in 2017 at 3% annual growth rate. The State lies on longitude 8^o 5$^{''}$ and 11^o 45$^{''}$ while latitude 9^o 30$^{''}$ N. It has the lowest and highest altitudes of 793m at Deba and 2,939m above sea level at kushi, with maximum and minimum temperature of 39.8^{0}C and 32.1^{0}C respectively (NPC, 2006). The State has unimodal rainfall distribution with total average annual rainfall of 880mm and a mean of 12 days per month. This number of rainy days could be attributed to dry spell that use to occur around July-August resulting to low crop yield. The rainfall spread between the months of April to October. The state is characterized by savanna grass land, some woody tree of height ranging between 2m to 8.5m.

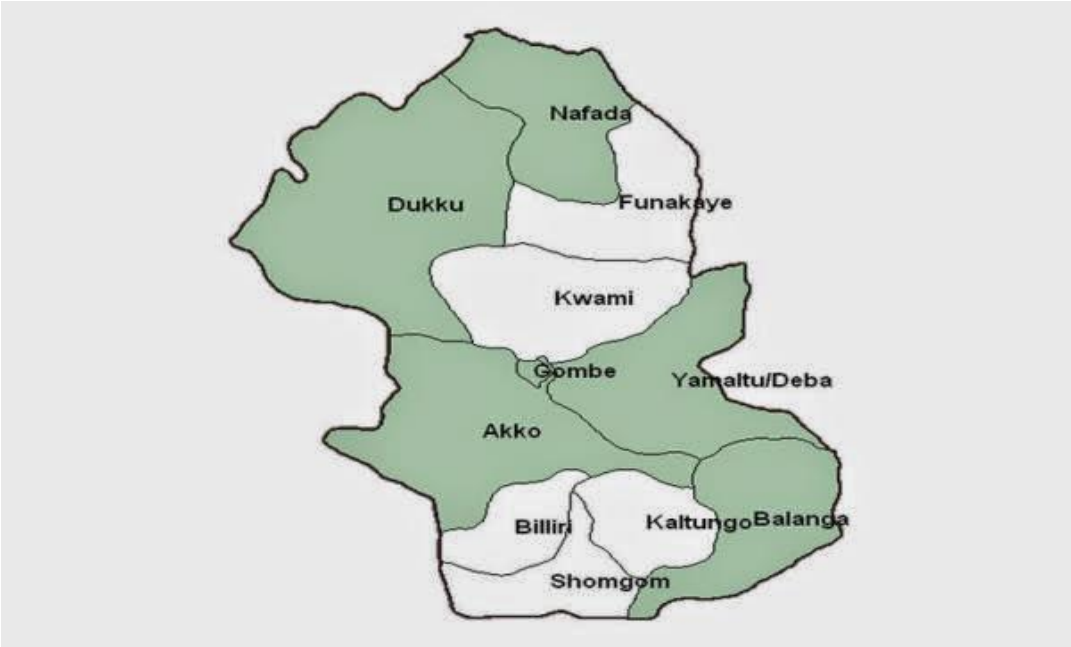

Figure 1: Map of Gombe State, showing the study LGAs: Akko, Funakaye and Billiri

Sampling Technique and Data Collection

A multi-stage random sampling procedure was employed as shown in Table 1. The first stage involved a purposive selection of three Local Government Areas (LGAs) based on predominance of sorghum production. Fifteen percent of the sample frame 172 was used as the sample size. Primary data with the aid of structured questionnaire and trained enumerators during 2014 season were employed.

Theoretical framework and Analytical Techniques

In assessing food security at the household level, the study used the cost-of-calories (CoC) method proposed by Foster *et al.* (1984) to determine the food insecurity line. This method yields a value that is usually close to the minimum calorie requirements for human survival. The process involves defining a minimum level of nutrition necessary to maintain healthy living. This minimum level is referred to as the "food insecurity line", below which households are classified as food insecured.

Table 1: Sample frame and sample size

LGAs	Villages	*Sample frame	Sample size (15%)
Funakaye	Ashaka-gari	320	48
	Bage	200	30
Akko	Kumo	160	24
	Gadawo	240	36
Billiri	Baganje	120	18
	Ayaba	107	16
Total		1147	172

*Gombe State Agricultural Development Programme (GSADP, 2013)

Calorie adequacy was estimated by dividing the estimated calorie supply for the households by the household size adjusted for adult equivalents using the consumption factor for age–sex categories. Therefore, using this method, the food insecurity line was given as:

$LnX = a + bC$ …….. (1)

Where X is the adult equivalent food expenditure (₦) and C is the actual calorie consumption/adult equivalent of a household (in kcal). The calorie content of the recommended minimum daily nutrient level (L) by Gohl (1981) was used to determine the food insecurity line (S) using equation 2:

$S=e^{(a+bL)}$ …… (2)

Where, S = food insecurity line, a and b = parameter estimates from equation 1, L = recommended minimum daily energy (calorie) level (2260 kcal). Based on the S calculated, households will be classified as food secured or food insecured, depending on which side of the line they fall.

Logit regression model was used to determine the food security status among sorghum farming households under ATA. The probability of determinant of food security of the farmers determined by an underlying response variable that captures their true economic. The underlying response variable y* in the case of binary choice is defined by the multivariate logit regression relation:

The relevant logistic expressions were given as:

$$Prob(y* = 1) = 1 - F * \left(\Sigma X_i \beta_j\right) = \frac{e^{\Sigma X_i \beta_j}}{1+e^{\Sigma X_i \beta_j}} \text{...(3)}$$

$$Prob(y* = 0) = F * \left(\Sigma X_i \beta_j\right) = \frac{e^{\Sigma \text{xi} \beta \text{j}}}{1 + e^{\Sigma \text{xi} \beta \text{j}}} \text{... (4)}$$

Where: F = The cumulative distribution function for $\mu_{i,\ldots}$

The explicit logit model was expressed as:

$$Y = \beta_o + \beta_1 X_1 + \beta_2 X_2 + \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots + \beta_9 X_9 + u \ldots (5)$$

Where: Y = Food security (1= food secured, 0 = not food secured), X_1 = Age of household head (years), X_2 = Household income (₦),X_3 = Education (years of formal schooling), X_4 = Output (tonnes), X_5 = Extension contact (number), X_6 = Membership of cooperative (years of participation), X_7 = Farm size (ha) and X_8 = Amount of credit obtained (₦), $\beta_1 - \beta_8$= The coefficients for the respective variables in the logit function and u = error terms.

RESULTS AND DISCUSSION

Summary statistics of the data reported in Table 2 reveals that about 34% of the sorghum farmers under ATA were within the age range of 41-50 years. The mean age of sorghum farmers was found to be approximately 48 years with minimum of 21 years and maximum of 77 years. Age has a significant influence on the decision making process of farmers with respect to adoption of improved farming technologies and other production-related decisions. This implies that the farmers are strong, agile, and active and could participate adequately in farming activities. This finding is similar to that of Oladimeji and Ajao, (2014), Adegboye (2011) which observed that youth constitute the majority of the cereal farmers in Nigeria and should be more flexible to new ideas and risk; hence they are expected to adopt innovations more readily than older farmers.

Farming experience as presented in Table 2 shows that about 53.5% of sorghum farmers had between 11-30 years of farming experience with minimum and maximum of 2 years and 40 years' experience respectively. The average farming experience for sorghum production is 18 years. Farming experience of a farmer determines his ability to make effective farm management decisions, not only adhering to agronomic practices but also with respect to input combination or resource allocation. Farming experience was expected to influence farm production efficiencies because of accumulation of skills noted that the longer a person stays on a particular job, the better his job performance tends to be (Oladimeji and Abdulsalam, 2013; Adebayo, 2006).

Table 1: Socio-economic characteristics of Sorghum farmers under ATA

Variables	Modal class (MC)			Min.	Max.	Mean	SE
	Range	F	%				
Age (years)	41-50	59	34.3	21	77	48	0.85
Farming experience (years)	11-30	92	53.5	2	40	18	0.84
Household size (number)	1-10	109	63.4	1	45	11	5.8
Formal education (years)	0	94	54.6	0	15	2.7	9.6
ATA credit (₦)	0	98	57.0	8,000*	950,000	59,000	8,279.3
Farm size (ha)	1- 5	147	85.5	1	18	3.9	3.8
Extension contact (number)	1-10	123	71.5	0	30	4	0.49
Cooperative (years)	Non-member	84	48.8	0	35	5	0.51

Table 2 also shows the distribution of sorghum farmers under ATA by household size. The majority of the farmers (63.4%) had household size that ranged from 1-10 persons with minimum of 1 person and maximum of 45 persons. The average household size was 11 persons implying that there was a reasonable number of family labour supply to accomplish various farm operations *ceteris paribus*. The significance of household size in agriculture hinges on the fact that the availability of labour for farm production, the total area cultivated to different crop enterprises, the amount of farm produce retained for domestic consumption, and the marketable surplus are all determined by the size of the farm household (Oladimeji and Abdulsalam, 2014, Amaza *et al.*, 2009).

Result shows that about 55% of sorghum farmers under ATA had no formal western education. The estimated mean years of schooling of sorghum farmers was 2.7 years, skewed towards informal education and in line with study of study of Ajao and Oladimeji, (2017), Oladimeji *et al.* (2016) among melon and soybean farmers in North Central Nigeria. Fifty-seven percent of sorghum farmers under ATA financed their sorghum production from personal savings with the minimum and maximum amount of credit obtained from ATA being ₦8,000 and ₦800,000 respectively. The low access to credit could be attributed to the fact that government seldom grants financial credit to farmers. Ekong (2003) asserted that credit is a very strong factor that is needed to acquire or sustain any enterprise; its availability could determine the extent of production capacity.

However, about 72% of the sorghum farmers under ATA had 1-10 times extension contact per cropping season. The maximum and minimum extension contacts observed was 30 and 0 times in a cropping season respectively with average of 4 times per season in sorghum productions. It is expected that extension services should enhance sorghum farmers' ability to efficiently utilize resources through the adoption of improved methods used in sorghum production in the study area. The results in Table 2 also reveals that about 85% of sorghum farmers had farm size that ranged from 1-5 hectares with an average of 3 hectares. This show that majority of the farmers have small farm size and were not able to enjoy economy of scale in production in line with studies of Oladimeji *et al.* (2016) on melon production in Kwara State; Sidi *et al.* (2014) on sesame production in Yobe State and Oladimeji and Abdulsalam 2013 on rice production in Kwara State of Nigeria.

Food Security Status of Sorghum Households under ATA Programme

Food security status of farming households is presented in Table 3. The result indicates that majority (81.4%) of farming households were food secured. This implies that the sorghum farmers were potentially food secured. The mean food security index of food secured and food insecured households were 1.43 and 0.81 respectively. The food insecurity gap of 0.19 and 0.43 implies that on average the food insecured households consumed 19% less than their daily calorie requirements whilst food secured households consumed 43% in excess of their daily calorie requirements. Per capital daily calorie requirement was estimated to be 2,260kcal which is lower than the national weighted average of 2,849 kcal (World Food Program, 1999; www.fao.org).

Table 3: Food security status of sorghum farming households under ATA

Item description	Food secure	Food insecure
Cost-of-calories equation: lnX=a +bC		
Constant		0.203 (1.708)
Slope coefficient		-1.32E-03(2.439)
Number of household	140	32
Percentage of household	81.4	18.6
Mean FSI	1.43	0.81
Food insecurity gap/Surplus index	0.43	0.19
FAO recommended daily energy levels (L)		2260 kcal

The result of food security status of sorghum farmers indicates that majority (81.4%) of farming households were food secure while 18.6% were not food secured. The mean food security index of food secure households was 1.43 and food insecure households were 0.81. The food insecurity gap of 0.19 and 0.43 for food insecure and food secure households respectively implies that on average the food insecure households consumed 19% less than their daily calorie requirements whilst food secure households consumed 43% in excess of their daily calorie requirements.

Determinants of Food Security Status of Farming Households

The determinants of food security status of farming households is depict in Table 4. The result shows that seven variables: household income ($p<0.10$), level of formal education (($p<0.10$), farm output ($p<0.01$), extension contact ($p<0.05$), cooperative membership ($p<0.05$), farm size ($p<0.05$) and access to credit ($p<0.05$) significantly influencing food security status of farming households. The coefficient of total annual income (0.220) indicates that the higher the income of households, the greater the probability of being food secure. This could be expected because, increased in income *ceteris paribus*, means increased access to food. This result is consistent with Abdulrahman *et al.* (2016) and Oladimeji *et al.* (2017) who revealed positive and significant relationship between household income and food security.

The coefficient of years of formal western education (-0.470) carries a negatively signed, thus suggesting that the higher the educational level of the household head, the more food secure (or less food insecure) the household tends to be and vice versa. This is as expected, since the level of education should positively affect the income earning capacity and level of efficiency in sustaining the household's food resources. This result implies that households who have household heads with relatively higher education are more likely to be food secure than those headed by unlettered household heads. The result coincides with the theoretical evidences that educational improvement could lead to awareness of the possible advantages of modernizing agriculture and improve the quality of labor. It is similar with the findings of Ramakrishna and Assefa, (2002).

The coefficient of farm output (0.111) was found to be positive meaning that the higher the output levels of household, the greater the likelihood of food security. However, the coefficient of access to extension services (0.417) has a negative

relationship with the food security status of a household. This implies that households with access to agricultural extension services tended to have less food insecurity than those that did not have such access and vice versa. This is because contact with extension services tends to enhance the chances of a household having access to better crop production techniques, improved inputs, as well as other production incentives that positively affect farm productivity and production and thus household food security status. TIWARI et al. ILEIA (1991) suggest indicators like productivity to measure sustainability.

The coefficient of membership of farmer association (0.306) carries a positive sign. This implies that farm households whose heads are members of cooperative societies or other farmers' organizations had higher tendency of being food secure than those households whose heads are not members. Membership of cooperative societies as observed by Olaoye *et al.* (2012) and Oladimeji *et al.* (2013) is therefore a factor which influences the adoption to improve farming techniques and apparently farm output.

The coefficient of farm size (0.392) is positive which implies that farm size exhibits a positive relationship with the food security status of a household. That is, households with larger farm size tend to be more food secure than those with smaller size, and vice versa. As a household's farm size increases, food security tends to increase. It must be noted that the smallness of holdings deters the use of mechanization and does not allow the use of modern inputs due to lack of purchasing power in the hands of small farmers.

The coefficient of access to credit (0.650) was found to have positive influence on food security status of households and in line with the *a priori expectations*. This is expected since credit serves as consumption smoothing mechanism which gives households temporal relief against the effects of food insecurity. The results of the study implies that household that received credit had greater chances of being food secured compared to those who did not have credit, *all things being equal*. The result of the study is in line with the findings of Pappoe (2011), who found that access to credit improves the food security status of farming households among bio-fuel producers.

Table 4: Determinants of food security status among households under ATA

Variables	Coefficients	Standard error	t-value
Constant	0.239	0.256	0.93
Age	-0.263	0.256	-1.03
Income	0.220	0.116	1.90*
Educational status	-0.474	0.274	-1.73*
Output	0.111	0.045	2.50***
Extension contact	0.417	0.182	2.29**
Cooperative association	0.306	0.149	2.07**
Farm size	0.392	0.195	2.01**
Amount of credit received	0.650	0.286	2.27**

***; **; *** significant at 10%, 5% and 1% respectively, R^2=0.751, R^2 adjusted = 0.623**

CONCLUSION AND RECOMMENDATIONS

Based on the findings of this study, it was concluded that ATA in the study area has contributed in sorghum production through the supply of inputs and majority of the farming households (81.4%) were found to be food secure. Results revealed that an increase in household's income, having access to credit as well as increase in the quantity of sorghum output improved the food security status of farming households in Gombe State. Given that sorghum is an important staple food in Nigeria, any attempt to increase its productivity would be a right step towards the resolution of food insecurity. Apart from ensuring a food security, increased sorghum production provides more employment opportunities for the unemployed citizens' long term in the country. This is in view of the importance of sorghum in household food demand. Therefore, timely distribution of inputs especially fertilizer should be done to enhance sorghum production.

REFERENCE

Abdulrahman, S., David, A. I., Yusuf, O., Abdulazeez, R. O. and Binuyo, G. (2016). Analysis of livelihood diversification by farming households in Kaduna State, Nigeria. 2nd International conference on Dryland Agriculture, Centre for Dry land Agriculture, Bayero University, Kano. 12th -16th December, 2016. Pp. 45-49.

Abubakar, I. U. (2008). Issues on crop production in northern Nigeria: Poor Crop Yields and Irrigation.

Adegboye, R. O. (2006). *Land Agricultural and Food Security in Nigeria,* 3rd Faculty Lecture, Faculty of Agriculture, University of Ilorin.

Akinmulewo, B. O., Oladimeji, Y. U. and Abdulsalam, Z. (2017). Assessment of the Profitability of improved apiculture in Federal Capital Territory (FCT) Abuja, Nigeria. *Journal of Sustainable Development in Africa*, 19(2): 24-36.

Amaza, P., Tahirou, A., Patrick, K. and Amare, T. (2009). Changes in household food security and poverty status in PROSAB area of Southern Borno State, Nigeria. Promoting Sustainable Agriculture in Borno State (PROSAB). International Institute of Tropical Agriculture, Ibadan, Nigeria : 1-40.

Ekong, E. E. (2003). *Rural Sociology: An introduction and analysis of rural Nigeria, Uyo*: Dove Educational Publication.

Food and Agriculture and Organization FAO. (2011). Nigeria General Information. FAO of the United Nations. Retrieved from http://www.fao.orgcountryprofiles/index/en/?iso3=NGA

FAO, (1999).The State of Food Insecurity in the World 1999. Rome, Italy.http://www.fao.org/docrep/007/x3114e/x3114e00.htm

Foster, J., Greer, E. and Thorbecke, E. (1984). A survey of aggregate measures class of decomposable poverty measures, *Econometrica,* 52: 761-766.

Federal Ministry of Rural Development (2012). Agricultural Transformation Agenda: We Will Grow Nigeria's Agricultural Sector (Draft). FMARD: Abuja.

Göhl, B. O. (1981). *Tropical Feeds.* FAO Animal Production and Health Series, No. 1981, 12: 529.

Hoddinott, J. and Yohannes, Y. (2001). Dietary Diversity as a Household Food Security Indicator. Washington,

D.C.: Food and Nutrition Technical Assistance Project, Academy for Educational Development. Pp 1-3

IFPRI, (2011). Transforming African Economics – Factsheet on Nigeria. International Food Policy Research Institute (IFPRI). Retrieved from: http://www.ifpri.org/publication/transforming- African-economies-factsheet-Nigeria.

National Population Commission, NPC, (2006). Report of 2006 population census. Abuja Nigeria,

Okuneye, P. (2001). Rising cost of food prices and food insecurity in Nigeria and its implication for poverty reduction. Economic and Financial Review. Retrieved from: http://www.cenbank.org/out/publications/efr/rd/2002/efrvol39-4-6.PDF

Omuemu, V., Otasowie, E. and Onyiriuka, U. (2012). Prevalence of Food Insecurity in Egor Local Government Area of Edo State Nigeria. *Annals of African Medicine,* 11(3) 139-145.

Oladimeji, Y. U. and Ajao, A. M. (2014). Structure and determinants of profit efficiency among small scale rice farmers in Kwara State, Nigeria. *International Journal of Applied Research and Technology*, 3(11): 27-33.

Oladimeji,Y. U. and Abdulsalam, Z. (2013). Analysis of technical efficiency and its determinants among small scale rice farmers in patigi L.G.A. of Kwara State, Nigeria. *IQSR Journal of Agriculture and Veterinary Science*. 3(3): 34-39.

Oladimeji, Y. U. and Abdulsalam, Z. 2014. An Economic analysis of dry season irrigated farming in asa river, Kwara State, Nigeria: implications for poverty reduction. *Journal of Sustainable Development in Africa*, 16(7): 1-15.

Oladimeji, Y. U., Abdulsalam, Z., Damisa, M. A. and Omokore, D. F. (2016). Estimating the determinant of poverty among artisanal fishing households in Edu and Moro Local Government Area of Kwara State, Nigeria. *Agriculture and Biology Journal of North America*, 4(4): 422-429.

Oladimeji, Y. U., Galadima, S. A., Abdullahi, M. Y., Abdulrahman, S., Hassan, A. A. and Ajao, A. M. (2017). Assessment of livestock entrepreneur of peri-urban broiler farmers in Kwara State, Nigeria: a food security approach. A conference paper at 31st Annual Conference of Farm Management Association of Nigeria (FAMAN) held at Abubakar Tafawa Balewa, Bauchi on 9th – 12th October 2017.

Olaoye O. A., Onilude, A. A. and Idowu, O. A. (2006). Quality characteristic of bread produced from composite flour of wheat, plantain and soybeans. *Africa J. of Biotechnol.* 5(11): 1102- 1106.

Pappoe, A. (2011). Effect of biofuel production on household food security in the central region of Ghana. Unpublished Thesis submitted to the Dept. of Agricultural Economics and Agribusiness, University of Ghana.

Ramakrishna, G. and Assefa, D. (2002). An empirical analysis of food insecurity in Ethiopia: the case of North Wello, Africa *Development,* 27(1/2): 127-143.

Sidi, A. G., Damisa, M. A., Yusuf, O. and Oladimeji, Y. U. (2014). Value Chain Analysis of Sesame in Bade and Jakusko Local Government Areas of Yobe State, Nigeria. *International Journal of Economic Development Research and Investment*, 5(3): 39-51.

Tiwari, K. R., Nyborg, I. L. P., Sitaula, B. K. and Paudel, G. S.(2008). Analysis of the sustainability of upland farming systems in the Middle Mountains region of Nepal. *International Journal of Agricultural Sustainability*, 6(4): 289–306.

Ugwu, D. and Kanu, I. (2011). Effects of agricultural reforms on the agricultural sector in Nigeria. *Journal of African Studies and Development*. 1:1-3

ABOUT THE AUTHORS

SANI Abubakar Abdullahi M Sc. Graduate in the Department of Agricultural Economics/ Institute for Agricultural Research (IAR), Ahmadu Bello University, Zaria, Nigeria. Presently, he is a Lecturer and PhD research student in the same Department.

SANNI, Shukurat Adunni is a Professor and currently the Head of Department of Agricultural Economics, Faculty of Agriculture, Ahmadu Bello University, Zaria, Nigeria. She is also an Assistant Director, Extension Management and Evaluation of Institute for Agricultural Research (IAR) Samaru, Zaria

Damisa, Maiyaki Abdullai is a Professor in the Department of Agricultural Economics, Faculty of Agriculture, Ahmadu Bello University, Zaria, Nigeria.

Oladimeji, Yusuf Usman is a lecturer in the Department of Agricultural Economics, Faculty of Agriculture, Ahmadu Bello University, Zaria, Nigeria.