



INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) USE AMONG HUNGRY RICE (ACCHA) FARMERS IN PLATEAU STATE, NIGERIA

¹Michael, I. W., ¹Garba, A. and ²Hamidu, B

¹Department of Agricultural Extension and Rural Development,
Abubakar Tafawa Balewa University, Bauchi, Nigeria.

Department of Agricultural Extension, Federal University Dutse, Jigawa State, Nigeria.

Corresponding Author's Email: paramike37@gmail.com **GSM:** 08177631115

ABSTRACT

The study examined the information and communication technology used by hungry rice farmers in Jos South and Barikin Ladi Local Government Areas of Plateau State. A multistage sampling procedure was used in selecting 160 respondents as the sample size of the study. A well-structured questionnaire was used for data collection and analysed using both descriptive and inferential statistics. The results showed that 51.9% of the respondents were male while 48.1% were female. Majority (43.75%) were within the age of 20-29 years with a mean age of 35.4 years. The respondents had a mean household size of 7 persons, cultivating an average farm size of 2.43 hectares and had a mean farming experience of 4.40 years in hungry rice farming. The findings revealed that the use of radio, television and mobile phone has increased the income and livelihood of the hungry rice farmers due to new methods learnt from agricultural programmes, also hungry rice farmers have been exposed to latest technology on hungry rice production through watching of documentaries and communicating with other hungry rice farmers and customers. Age, farm size and farming experience were statistically significant ($P < 0.01$) and ($P < 0.05$) respectively. The study also revealed that the problems faced by the respondents were irregular power supply (41.3%), high cost of ICT devices (50.0%), and inadequate knowledge on technical know-how (46.3%). The study concluded that age, farm size and farming experience were the factors that influence the use of ICT among Acha farmers in the study area. It was therefore recommended that hungry rice farmers should be encouraged to access and utilize ICTs by supporting them financially and materially by the governments and private sectors/donor agencies and government should improve on electricity supply to the rural areas which will enable the farmers to utilize the ICT devices.

Keywords: Effect, ICT, Hungry-Rice, Farmers.

INTRODUCTION

Hungry Rice (Acha) (*Digitaria Spp*) is a cereal crop from the grass family. It is a small herbaceous plant that grows to a height of 30 – 80 cm. hungry rice or Fonio is suggested to be the oldest indigenous African cereal with cultivation records dating back to 7000 years (Crutz, 2004). Hungry rice is grown in Africa specifically in West African region; such as Nigeria, Senegal, Ghana, Guinea Bissau, Senegal, Togo, Mali, Benin Republic and Cote-d'Ivoire (Jideani, 1999; Gyang and Wuyep, 2005). According to FASOSTAT (2003), a total area of 347, 350 ha was devoted to hungry rice cultivation in Africa in 2002 with Nigeria providing almost half of the area. According to CBN (1998) estimated that about 70,000 metric tons of hungry rice was being produced annually in Nigeria. However, average yield per ha of hungry rice has been as low as 600 – 700 kg /ha (Cruz, 2004). The key use of hungry rice is for food human – a staple food in various parts of West Africa. It is also traditionally a prestige food



(Chief's Food) and a gourmet item in some communities. It is made into couscous, tick unfermented porridge 'tuwon acha' or fermented one – 'kunu'. Boiled whole grains are eaten with vegetables, fish or meat. Hungry rice is also popped and can be mixed with other flours to make bread (Vodoule and Achigan, 2006).

The Hungry rice or Fonio grains are now produced by small enterprises and sold not only in local/ urban markets, but also to Africans who emigrated to Europe and United State. Export markets are now in place arising from the strong consumer demand partly due to its nutritional qualities (Laseken, 1994 and Jideani, 1999) and because it helps to satisfy demand for more varied cereal diet. In Nigeria, hungry rice is grown on commercial quantities in some states such as Bauchi, Kaduna, Kebbbi, Plateau, Nassarawa, Niger, Gombe, and FTC with Plateau State being the highest producer with an estimated 200,000 tons per annum (Gyang and Wuyep, 2005). However, the report of Dauda *et al.* (2003) indicated that when the economic returns from acha production was compared with other grains such as rice, sorghum, and cowpea, it was found to be higher. Sani and Silas, (2012), reported that despite the valuable importance of acha particularly the nutritive and latent properties, which is recommended for lactating women and diabetic patients, its cultivation is still very low in Nigeria. This may be partly due to low information access of the acha farmers in the study area. Hence, the study was consummated to ascertain the use of information communication technology ICTs among hungry rice farmers in the study area. Scientists pointed out that hungry rice crop received little attention from researchers and other agricultural scientists when compared with other cereal crops like maize, rice, millet, and sorghum. Hence, its adoption and cultivation are not widely spread among its farmers in Nigeria implying that the potential value of the crop is still under exploited. The development of Information and Communication Technology (ICT) has impacted every aspect of human life including production and workmanship. ICT application in agriculture is increasingly becoming steady in developing countries, facilitating self-reliance for national growth (Opara, 2008). Electronic agriculture describes an emerging field focused on enhancing agricultural and rural development through improved information and communication processes. The e-agriculture disseminates useful information through Decision Support System (DSS), Management Information System (MIS) and Expert System (ES) by infusing the User Interface and Knowledge Management System (Behera *et al.*, 2015; Bhalekar *et al.*, 2015).

In many countries, low agricultural production has been attributed to poor linkages between Research-Extension-Farmers and ineffective technology delivery systems, including poor information packaging, inadequate communication systems and poor methodologies. Therefore, the information systems which integrate farmers, agricultural educators, researchers, extensionists and farmers should be introduced for the agriculture sector. They operate as facilitators and communicators, helping farmers in their decision making and ensuring that appropriate knowledge is implemented to obtain the best results in terms of sustainable production and general rural development) and the private sector (support and input services, traders) to harness knowledge and information from various sources for better farming and improved livelihoods (FAO, 2005). However, this integration among people and institutions, particularly in the research-extension farmer relationship, has not been successful in many parts of the developing (and developed, for that matter) world. Literatures have shown that little research was conducted on the use of information technology among hungry rice farmers in the study area. It is against this backdrop this research wish to be conducted. The broad objective of the study was to examined the effects of use of ICT among Hungry rice



farmers in Jos South and Barikin Ladi Local Government Areas of Plateau State while the specific objectives were to:

- i. describe the socio-economic characteristics of the respondents in the study area;
- ii. determine the effect of ICT usage on hungry rice farmers;
- iii. determine factors influencing ICT usage among hungry rice farmers; and
- iv. describe the constraint affecting ICT usage in the study area.

MATERIALS AND METHODS

The Study Area

The study was carried out in Jos South and Barkin Ladi LGA's of Plateau state. Plateau State is located in the north-central zone of Nigeria and lies between latitude 8°30' and 10°30'N, longitude 7°30' and 13°37'E with a landmass covering 30, 913sq kilometres. The state was created on 3rd February 1976, from Benue-Plateau, with its administrative headquarters in Jos. It is structured into 17 local government areas (LGAs). Plateau State has an estimated population of 3,178,712 (NPC 2006) with a projected population of 4,717,300 using 2.4% increase in 2022. It is bounded by Kaduna and Bauchi states on the north, Taraba on the east and Nasarawa on the south and west. The Jos, Plateau rises to about 5,250 feet (1600m) above sea level in the north-central state's part, and the Benue River-Valley stretches along the south-east border. Though situated in the tropical zone, a higher altitude means that Plateau State has a near temperate climate with an average temperature of between 13 and 22 °C. Although there are wooded valleys in the southeast, the vegetation is mostly open grassland which is suitable for grazing and farming. (FAO, 2010). Based on soils, climate and typical farming systems, the state is classified into three distinct agro-ecological zones, namely; the moist lowland savannah, which falls within southern Guinea and Savannah rain forest, having extensive low-lying flat land with high water holding capacity favourable for the production of rice, yam, cassava, melon and groundnut. The mid-latitude zone falls within 500-1,500 meters above sea level, with soils that are sandy clay and heavy rains, while predominantly maize, Irish potato, and assorted vegetables and produced. (FAO, 2010). The climate is characterized by two distinct wet and dry seasons. The wet season starts in late April and ends in October, while the dry season starts in November and ends mid-April. The mean annual rainfall is about 1450mm, and relative humidity of 60%. The mean monthly maximum and minimum temperatures are 20°C and 15°C, respectively. (FAO, 2010).

Plateau State is an agrarian State, with about 70% of the populace involved in agriculture (crop and livestock). There is a high concentration of livestock and crops such as cattle, sheep, goat, layers, broilers, cross-bred local chickens, and quails; crops like, accha, millet, groundnut, sorghum, and cowpea are produced. It has open grassland vegetation usually used for grazing and farming with notable stip-slopping mountains. The region has a plurality of cultures.

Sampling Procedure and Sample Size

A multi-stage sampling technique was used in the selection of the respondents for the study. In the first stage, Jos South and Barikin Ladi Local Government Areas were purposively selected for the study based on intensity of Hungry rice farming in the area. In the second stage, three (3) districts each from Jos South and Barikin Ladi Local Government were randomly selected for the study making a total of six (6) villages for the study. In the third stage, a proportion of 10% was used to get the required number of farming household from the list of farming families in the selected villages. A total of 160 farming households were used



as the sample size for the study as presented in Table 1. The number of farming families was obtained from the list of farmers in Jos South and Barikin Ladi Local Government Area PSADP (2020).

Table 1: Sampling and Sample Size Selection Plan

LGA	Districts	Sample Frame	Sample Size (10%)
Jos South	Du	289	29
	Gyel	326	33
	Zawan	188	19
	Sub total	3	803
Barikin Ladi	Heipang	234	23
	Kassa	269	27
	Dorawa	297	29
	3	800	79
Total	6	1603	160

Source: Reconnaissance survey, 2023

Method of Data Collection

Data were collected using structured questionnaires which were administered by well-trained enumerators. The information contain in the questionnaire includes socioeconomic characteristics, effect of ICT usage and constraints.

Method of Data Analysis

The data were analyzed using of both descriptive and inferential statistics. Descriptive statistics was used to achieve objective i, ii and iv of the study. On the other hand, logit regression analysis was used to determine the effect of ICTs usage among Hungry rice farmers in the study area.

Descriptive statistics

Descriptive statistics: (frequency, Percentage, mean and standard deviation) will be used to achieve objective i, ii and iv.

Logit regression model

The objective three (iii) of the study was achieved using the logit regression model which is to determine the effect of ICTs used among the respondents. Following Rahji and Fakayode (2019), the model is specified as:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \dots + \beta_{11} X_{11} + e_i$$

Y = Use of ICTs facilities (Yes = 1, 0 otherwise).

The independent variables include:

X₁ = Age of the respondents (years)

X₂ = Household size (number)

X₃ = Primary occupation of the respondent (agricultural = 1, 0 if otherwise)

X₄ = Farm size (ha)

X₅ = Membership of society (members=1, 0 if otherwise)

X₆ = Sex of the respondents (male = 1, 0 if otherwise)

X₇ = Marital status (married = 1, 0 if otherwise)

X₈ = Years of education

X₉ = Income from primary occupation (₦)

B₀ = Intercept



$\beta_1 - \beta_{11}$ = Coefficients
 ϵ_i = Error term.

RESULTS AND DISCUSSION

Socioeconomic Characteristics of the Respondents

The socioeconomic characteristics of the respondents are paramount factors of considerations in the study of income diversification in the study area. These factors include age, sex, marital status, household size, educational level, farm size among others.

The results in Table 2 shows that male hungry rice farmers accounted for 51.9% of the respondents while female hungry rice farmers accounted for 48.1% in the study area. This indicated that both genders are involved in hungry rice farming, but males are more involved than females. The results buttress the work of Temu (2014), that more men are engaged in hungry rice farming than women. This is also, in tandem with the report of Oluwatusin and Sekumade (2016) that majority of farmers in Nigeria were male.

The results further disclosed that hungry rice farmers between the ages of 20-29 years has the highest percentage of 43.75%, out of the total respondents while 28.75% and 0.63% fell within the age bracket of 30-39 and 40-49 years respectively with a mean age of 35.4 years. This shows that the respondents were in their middle and active age and were engaged more in hungry rice farming than the younger farmers. This result corroborates with the findings of Babatunde and Qaim (2009) who reported that a household with more economically active adults, other things being equal, will be more likely to produce more. The result further shows that 75.0% of the respondents were married while 25.0% were single. This shows that most of the respondents were married, which implies that they were matured and responsible, this was in line with the findings of Akinbile (2007) who stated that marriage confers responsibility. The results further showed that majority (61.9%) of the respondents do not have formal education at all while 18.1% had HND/BSC education. The result further shows that 10.0% had primary education and secondary education respectively in the study area. This implies that most of the respondents were having low level of education and very few have secondary education. This means there is problem of availability of relevant and localised contents in own languages and not able to adopt new technologies (Davis and Adom 2010). The results also showed that 33.75% practised Islamic religion while 43.13% were Christian and 23.1% practise traditional religion. This means that whether you are Muslim or Christian does not affect your being involve in hungry rice farming. The result further shows that 44.4% of the total respondents had civil service as their major occupation while 42.5%, 11.9% and 1.3% were into farming, trading and artisanship respectively. This indicates that majority of the respondents were into other activities aside from hungry rice farming in the study area.

The result from Table below show the distribution of the respondents based on household size, farm size and farming experience in the study area. The result depicts that majority (43.12%) of the respondents had household size of 1-5 persons while 31.25% and 25.63% had household size of 6-10 and 11-15 persons per household respectively. The mean household size was 7 persons per household which indicated the availability of family labour to carryout farming activities. Similar result was reported by Oluwatusin and Sekumade (2016) in a research titled Farm Households Income Sources Diversification Behaviour in Nigeria that the minimum household size was 1 while the maximum was 18. The mean household size was 9.

The result also revealed that most (90.62%) of the respondents had farm size of between 1-5 hectares while 5.63%, 2.5% and 1.25% of the respondents operate on farm land of between



11-15ha, 6-10ha and 16-20 hectares of land respectively. The mean farm size was 2.43 ha which implies that hungry rice farmers were operating on small scale. it ran consistently to the findings of Fabusoro *et al.* (2017) who reported that about 90 % of Nigeria's food is produced by small scale farmers who cultivate small plots of land of 0.1-2.0 hectares with crude implements and depend on rainfall rather than irrigation system. The result disagreed with Oluwatusin and Sekumade and (2016) who reported a mean farm size was 4 hectares.

The result from the table further revealed that most (82.5%) of the respondents had experience of 1-5 years in hungry rice farming while 6.83%, 6.25% and 4.37% had experience of 6-10, 11-15 and 16-20 years of farming experience respectively. The mean years of experience was 4.4 years which implies that respondents in the study area were having a reasonable experience in hungry rice farming.



Table 2: Distribution of the respondents based on Socioeconomic Characteristics (n = 160)

Age	Frequency	Percentage	Mean
20-29	70	43.75	35.4
30-39	46	28.75	
40-49	1	0.63	
50-59	16	10.0	
60 and above	27	16.87	
Sex			
Male	83	51.9	
Female	77	48.1	
Marital status			
Single	40	25.0	
Married	120	75.0	
Educational level			
Non-formal	99	61.9	
Primary	16	10.0	
Secondary	16	10.0	
HND/BSC	29	18.1	
Religion			
Christianity	69	43.13	
Islam	54	33.75	
Traditional	37	23.12	
Occupation			
Farming	68	42.5	
Trading	2	1.3	
Civil service	71	44.4	
Artisan	19	11.9	
Household size			
1-5	69	43.12	7
6-10	50	31.25	
11-15	41	25.63	
Farm size			
1-5	145	90.62	2.43
6-10	4	2.5	
11-15	9	5.63	
16-20	2	1.25	
Farming experience			
1-5	132	82.5	4.40
6-10	11	6.88	
11-15	10	6.25	
16-20	7	4.37	

Source: field survey, 2023

Effects of Radio on Hungry Rice Farming

The result in table 3 shows that 93.8% of the respondents were of the opinion that their income has increased due to new method learnt from agricultural programmes on



radio broadcast. Also 90% of the respondents have been enlighten on various agronomic hungry rice practices through agricultural programmes on radio. 71.3% of the hungry rice farmers in the areas reported that their customers have increased due to advertising their farms on radio. This implies that through agricultural programmes on radio, the hungry rice farmers in the study area have experience improvement in their production capacity. Majority (97.5%) of the respondent's profit has increased due to increase in their income.

Table 3: Effects of radio on hungry rice farming (n = 160)

Radio	Yes	No
My income has increased due to new methods learnt from agric programme	150(93.8)	10(6.2)
Through agric programmes, I have been enlightened on various agronomy hungry rice practise	144(90.0)	16(10.0)
My customers has increased as a result of advertising my farm on radio	114(71.3)	46(28.7)
My profit has increased due to increase in my income	156(97.5)	4(2.5)

Source: Field survey, 2023

Percentage in parentheses

Effects of Mobile Phone on Hungry Rice Farming

The result in table 14 shows that 88.8% of the respondents have received information from extension agents through the use of mobile phone which serves as a means of better communication. About 90.0% of the respondents in the study area reported that the use of mobile phone has greatly improved their ways of communicating with other hungry rice farmers. Furthermore, 82.5% of the hungry rice farmers found it easier to source for agro-inputs with the use of mobile phone while 86.3% of the respondents in the study area got information on agencies involved in agricultural credit facilities through the use of mobile phone.

Table 4: Effects of mobile phone on hungry rice farming (n = 160)

Mobile phone	Yes	No
Acquiring information from extension is now easier due to better communication	142 (88.8)	18 (11.2)
Communication with other hungry rice farmers and customers has improved greatly	144 (90.0)	16 (10.0)
Sourcing of agro-inputs is now easier and better done	132 (82.5)	28 (17.5)
Information on agencies involved in Agric facilitating is easier to get through the use of mobile	138 (86.3)	22 (13.8)

Source: Field survey, 2023

Percentage in parentheses

Factors influencing the ICT Usage among the Respondents

The result from Table depicts that the factors influencing ICT usage in the study area, the result showed that age was statistically significant ($P < 0.01$) influencing ICT usage among hungry rice farmers in the study area with a negative coefficient (-1.527) which implies that younger farmers are more likely to used ICT facilities in accessing information than older farmers who were characterized as late adopters or laggards. The result further revealed that farm size (0.241) was positive and statistically significant influencing the use of ICT among hungry rice farmers ($P < 0.05$). This implies that as farm size increases the use of ICT facilities in sourcing information on how to improve their productivity also increases and vice-versa. This conform

with the a priori expectation which stated a positive relationship between farm size and use of ICT. The result also shows that farming experience is positively significant $P < 0.05$ influencing ICT usage in the study area with coefficient (0.143), this indicated that as farming experience increases so also ICT usage increases and vice versa.

Table 5: Socioeconomic characteristics influencing ICT usage

Variables	B	S.E.	Wald	Sig
Age	-1.527	.394	15.062	.000***
Marital status	.387	.467	.685	.408
Educational Level	.090	.130	.478	.489
Occupation	-.192	.151	1.623	.203
Household size	-.054	.052	1.089	.297
Farm size	.241	.101	5.730	.017**
Farming experience	.143	.056	6.559	.010**
Constant	1.528	1.172	1.700	.192

-2 Log likelihood = 180.957^a

Cox & Snell R Square = 0.197

Nagelkerke R Square = 0.266

Chi-square = 35.192***

Source: field survey, 2023

note: ** significant at 5%, *** significant at 1%

Constraints to Effective Use of ICT

The result in Table 12 reveals that insufficient financial resources (63.8%), high cost of ICT devices (50.0%), inadequate knowledge on technical know-how (46.3%) and irregular power supply (41.3%) were the major constraints while cost of maintenance (45.0%) and high cost of ICT devices (40.0%) were the minor constraints experienced by the hungry rice farmers. ITU (2010) stated that rural people mostly live sparsely and this would make provision of infrastructure and public utilities such as electric power, water, health facilities, and some devices of modern ICTs very difficult to deploy in rural areas. Private companies invest their resources in areas where they would get good returns. In addition, the provision of ICT service would require electricity and technical know-how which are limited in most places of rural areas. Income of the rural people tends to be low as compared to urban areas and many rural households simply cannot afford modern ICT devices such as computers and the internet.

Table 6: Constraints to ICT Usage

Constraints	Major constraint	Minor constraint	Not a constraint
Irregular power supply	66 (41.3)	48 (30.0)	46 (28.8)
High cost of ICT devices	80 (50.0)	64 (40.0)	16 (10.0)
Poor network connection	38 (23.8)	18 (11.3)	104 (65.0)
Poor knowledge on technical know-how	74 (46.3)	46 (28.8)	40 (25.0)

Source: field survey, 2023

CONCLUSION AND RECOMMENDATION

The study concluded that age, farm size and farming experience were the significant factors influencing the use of ICT facilities among hungry rice farmers. However, the major constraints encountered by hungry rice farmers in ICT usage were irregular power supply, high



cost of ICT devices, and poor technical know-how of ICT devices. In view of the constraints highlighted it is therefore recommended that Hungry rice farmers should be encouraged to access and utilize ICTs by supporting them financially and materially by the governments and private sectors/donor agencies and more awareness and training of both farmers and extension agents on the effective and efficient use of ICT facilities should be intensified by the governments through extension agencies.

REFERENCES

- Akinbile, T. (2007). Technical center for agricultural and rural cooperation ACP-EU (2009). Annual report. 2007. DH.Neun. The Netherland. CPA.
- Babatunde R. O. and Qaim, M. (2009) Patterns of income diversification in rural Nigeria: determinants and impacts. *Quarterly Journal of International Agriculture*, **48**(4): 305–320.
- Behera, B. S., Das, T. K., Jishnu, K. J., Behera, R. A., Behera, A. C. and Jena, S., (2015). E Governance Mediated Agriculture for Sustainable Life in India. *Procedia Computer Science*, **48**, pp.623-629.
- Bhalekar, P., Ingle, S. and Pathak, K., (2015). The Study of Some ICT Projects in Agriculture for Rural Development of India.
- Central Bank of Nigeria, (2008). Statistical Bulletin
- Cruz, J. F. (2004). Fonio: A small grain with potential. In: *Magazine on LEISA*. Vol. **201**, March, 2004, 16-17. (Low external input and sustainable) Agriculture.
- Dauda, A. and Luka D. (2003) Status of Acha (*Digitaria exilis*) production in Bauchi State, Nigeria. In: Proceedings of the first National Acha Stake holders Workshop held at PADP Jos, (9th _ 11th March, 2003 Kwon- Ndung E H, Bright E O and Vodeule R (eds); Unpublished.
- Davis, K. E. and Addom, B. K. (2010). Subsaharan Africa in R.Saravanan. Ed. ICTs for Agricultural Extension; Global experiments innovations and experiences. New Delhi.
- Fabusoro, E., Maruyama, M., Fu, H. Y., & Alarima, C. I. (2017). Helping Peasant Farmers in Nigeria through Agricultural Cooperatives: Lessons from Japan Agricultural Cooperative Model. *Journal of Agricultural Science and Environment*, **17**(1): 1-24.
- FAO. (2005). Agricultural Knowledge and Information Systems for Rural Development (AKIS/RD).Strategic Vision and Guiding Principles.
- FAOSTAT 2003 Database Food and Agricultural Organizations. Fibre diet. *Journal of Food processing and Preservation for nutrition and health Bulletin* **34**:225-231, **32**:853-867
- Food and Agricultural Organisation, FAO (2013). Information and communication technologies for sustainable agriculture: Indicators from Asia and the Pacific. Edited by Gerald Sylvester. Rap Publication 2013/14.122 pages. Available at www.fao.org
- Gyang, J. D., and Wuyep, E. O. (2005). Acha: The grain of life. *A bi-annual publication of the Raw Material Research and Development Council*, **6**(1): 39-41.
- ITU (2010). World Telecommunication/ICT Development Report 2010. Monitoring the WSIS targets. A mid-term review. International Telecommunication Union (ITU). Geneva, Switzerland.
- Jideani, I. A. (1999). Traditional and possible technological uses of *Digitaria exilis* (acha) and *Digitaria iburua* (iburu): a review. *Plant Foods for Human Nutrition*, **54**: 363-374.
- Lasekan D. O. (1994) Chemical Composition of Acha (*Diteria exilis*) flour. *Journal of Food Science and Agriculture*, **14**: 177- 179 pp.



- Maningas, R. V., Perez, V. O., Macaraig, A. J., Alesna, W. T., and Villagonzalo J. (2005). "Electronic Information Dissemination through the Farmers' Information and Technology Services (FITS)/Techno Pinoy Program. Bringing Information and Technology within reach of the Farmers." from <http://jsai.or.jp/afita/afita-conf/2000/part08/p231.pdf>, 2000.
- National Bureau of statistics. (2016). Agriculture. [https:// www.nigeriastat.gov.ng/sectorstat/sectors/Agriculture](https://www.nigeriastat.gov.ng/sectorstat/sectors/Agriculture)
- National Population Commission (NPC) (2006). Human Population Figures of Census in Nigeria.
- Oluwatusin, F. M., & Sekumade, A. B. (2016). Farm household income sources diversification behaviour in Nigeria. *Journal of Natural Sciences Research*, **6**(4): 102-111.
- Opara, U. N. (2008). "Agricultural Information Sources Used by Farmers in Imo State, Nigeria." *Information Development*, **24**(4): 289-295.
- Sani, M. H. and Silas, Y. G. (2012). Socio-Economic Determinants and Production Constraints in Adoption of New Variety of Acha (*DigitariaSpp*) in Plateau State, Nigeria. *Continental J. Agricultural Economics*. Vol: **6**(3): pp 15-22.
- Temu, A., Waized, B., Ndyetabula, D., Robinson, E., Humphrey, J., & Henson, S. (2014). *Mapping value chains for nutrient-dense foods in Tanzania*. Institute of Development Studies.
- Vodouhe, S R and Achigan Dako, E G (2006) *Digitaria exilis* (Kippist) Stapf In: Brik, M. and Belay, G (eds). PROTA 1 Cereals and pulses/Cereales et legumes sec. [CD-Rom] PROTA Wageningen, Netherlands.