ANALYSIS OF WELFARE DETERMINANTS AND CONSTRAINTS TO SEED YAM FARMERS IN NORTH-CENTRAL NIGERIA

[1, 2]BOLAJI M.*, [1]BABATUNDE, R.O., [1]OMOTESHO, O.A., AND ADEKUNLE, A.O.

[1]Department of Agricultural Economics and Farm Management, University of Ilorin, Kwara State, Nigeria
[2]Nigerian Institute of Social and Economic Research, Oyo State, Nigeria
**Corresponding Author's Email: rollyeve@gmail.com*

ABSTRACT

Welfare, for most developing and underdeveloped countries, has become an important phenomenon for discussion. In Nigeria, the prevalence of food insecurity and poor welfare of farming households have been increased by problems such as climate change, and insurgencies. This situation has led to the development of many intervention programmes in Nigeria and across Africa. This study sought to evaluate the welfare determinants of seed farmers and examine the constraints to the usage of seed yam production technologies. The study made use of a quantitative research design; a Multistage sampling technique was used to select 283 seed yam farmers. Cross-sectional data were collected through the use structured questionnaire. The target population were seed yam farmers in the FCT and Benue State. Data were analysed using Ordinary Least Square regression and Weighted Average Index ($p<0.05$). The findings of the studies indicated that access to credit (-0.1557), years of schooling (-0.0105), farm size (0.0504), source of labour (0.0558) and extension service (0.1031) significantly affected the welfare of the seed yam farmers. Likewise, crop and field management was ranked the most important constraint for CAY-Seed (43%) and NRCRI-Seed yam farmers (26%). The study concludes that access to credit and the years of schooling for the seed yam farmers did not improve their welfare. However, land and labour availability and access to extension services helped to improve the seed yam farmers' welfare. Similarly, land, labour and extension services should be made readily available for seed yam farmers which would help to improve their welfare status.

Keywords: Agriculture, Seed yam, Technology, Welfare

1. INTRODUCTION

Welfare has been defined as a state of well-being, especially with regard to the level of utility attained by a household. It is said to represent a household's standard of living (Eneji *et al.,* 2018). Similarly, most households majorly focus on providing adequate food for members as well as shelter and clothes. However, the primary cause of poor welfare has been linked with a prolonged lack of economic opportunities by various households which are imperative to produce adequate amounts of food and further generate extra household income.

Thus, as income increase, poor farmer households tend to spend more on food to acquire diverse varieties of food rather than investing in other off farm income generating activities. However, the current state of welfare in the world is becoming alarming as it has been projected that the population of the world will increase from seven billion people to nine billion by 2050 (FAO 2017; Iris, *et al.,* 2018). Poor levels of welfare and food insecurity continue to be a major challenge to the world. This problem is more pronounced in developing countries, such as Nigeria, due to several challenges which have led to a decline in welfare as well as output of food crops.

In Nigeria, the prevalence of poor welfare and increased food insecurity has been aggravated by challenges such as urbanization, climate change, and insurgencies. The production of staple food crops has deteriorated in areas witnessing insurgencies. This has led to the development of many intervention programmes in Nigeria and across Africa. Ukoha *et al.,* (2007) stated that the central objective of introducing intervention programmes is to ensure that households increase their productivity and efficiency to achieve higher levels of income and outputs while accruing more assets to improve the welfare of households. Welfare programmes generally give a minimum amount of income to poor households who need capital to increase their productivity (Eneji and Mbeh, 2018). It is however important to note that many Nigerian households particularly in rural areas cannot afford to purchase the required farm inputs necessary for increased productivity. In farming households particularly seed yam farmers, the production of seed yams particularly in Nigeria has been faced with quite a number of challenges which can be categorized into ten groups: soil-borne pests and diseases, a decline in soil fertility, leaf disease, high labour cost for land (heap) preparation, consumer preference, lack of staking materials and barn making, scarcity of planting materials, storage pests and diseases, use of traditional production technology for seed yam and weed pressure (Manyong *et al.,* 2001).

Similarly, seed yam production in Nigeria has been noted to be labour intensive, with the high labour cost being a major constraint to seed yam production. Thus, high labour cost has deprived seed yam farmers of increasing their farms' productivity (Migap and Audu, 2012). In most cases, members of households engage in all the production and marketing activities of seed yams/ yams to reduce labour costs (Ike and Inoni, 2006). In addition, it has been observed that most farmers use about 25 per cent of ware yams harvested as planting material for the next planting season and where the number of seed yams required is large, farmers' need for more planting materials becomes higher (Katung *et al.,* 2006 cited in Emmanuel, 2017). Wossen *et al.,* (2017) stated that access to extension services improved farmers' welfare through the application of technical knowledge been introduced to the farmers for improved productivity. Other studies that accessed the determinants of household welfare includes Kabber (2001) who stated that micro credit had a significant positive effect on joint decision making of households. It is imperative to note that the economic and non-economic positive effects

of micro credit contribute to improvement of welfare of households. Similarly, studies on welfare have shown that micro credit, household income, and human assets, can be used to explain household welfare. Keyereme and Thorbeeke (1991) stated that the employment status of household members and age composition affect household welfare. Likewise, Quartey (2005) discovered that physical assets and household size affect household welfare.

This study however sought to further to assess the determinants of welfare for some groups of farmers who were members of two major yam improvement projects in Nigeria. It is important to note that, before the establishment of CAY- and NRCRI - seed yam projects, seed yam farmers experienced major constraints. However, the National Root Crop Research Institute and the Community Action in Improving Farmers Saved Seed Yam (CAY-Seed) projects were established in 2004 and 2014 to help solve constraints to seed yam production faced by seed yam farming households in Nigeria. Hence, the study assessed the welfare determinants of seed yam farmers and examined the constraints to the usage of seed yam production. This research was necessary due to the prevalence of many rural poor farmers who still experience poor welfare. The paper needed to ascertain what determinants influenced the welfare seed yam farmers who were participants of an intervention project. This study contributes knowledge to researchers who focus on welfare studies, this study is also relevant to policy makers who develop intervention programmes for farmers in Nigeria. The rest of the paper is sectioned as follows: Section 2 contains the methodology of the study. Section 3 provides the findings of the study and section 4 presents discussion of results while section 5 provides the conclusion and recommendation of the study.

2. MATERIALS AND METHODS

The study was carried out in Nigeria using the Federal Capital Territory (FCT) and Benue state as study areas (North-central). Nigeria is located on the Gulf of Guinea. The country lies between latitudes 4° and 14°N, and longitudes 2° and 15°E (Ebele *et al.,* 2014). Nigeria has a land mass of about 923,768 km^2. The FCT was selected because it was a previous pilot site for the Yam Improvement for Income and Food Security in West Africa (YIIFSWA) seed yam project which was held in 2011. In addition, the concentration of various actors in yam production ranging from yam input sellers to marketers and distributors are present in the FCT. The FCT has tropical wet and dry climates and lies between longitudes 6.45^0E and 7.29^0 E and latitudes 8.25^0 N and 9.4^0 N.

The FCT has an annual rainfall of 1215-1500mm and a temperature of 28 °C to 30 °C. It also has a total population of 7,128,100 persons (NPC 2016; NBS 2016). Benue State lies between 7°20′N and 8°45′E experiences both dry and wet seasons. The annual rainfall varies between 1215-1500mm, while the temperature fluctuates between 21°C to 37°C. The land area for Benue state is about 34,059 km^2 (13,150 sq mi) and it has 23 LGAs which are further divided into 3 ADP zones. Benue state has a total population of about 5,741.600 persons (NPC 2016).

A multistage sampling technique was used for the study. The first stage was a purposive selection of the FCT and Benue State because they were pilot sites for the seed yam projects in Nigeria. The second stage was the selection of seed yam farmers who participated in the two projects while the third stage involved a random selection of 283 seed yam farmers (133 CAY-Seed yam farmers and 150 NRCRI-Seed yam farmers).

Primary data was used for this study. Primary data was collected via the use of a structured questionnaire. The ordinary least square regression model was used to assess welfare determinants of seed yam farming households while the weighted average index was used to evaluate the constraints to the usage of seed yam technologies by both categories of farmers (CAY- and NRCRI - seed yam farmers).

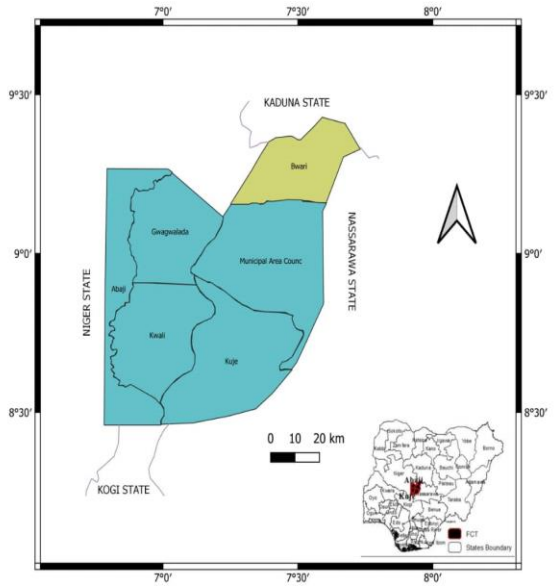

Figure 1: The map of the FCT

Source: Google Maps.

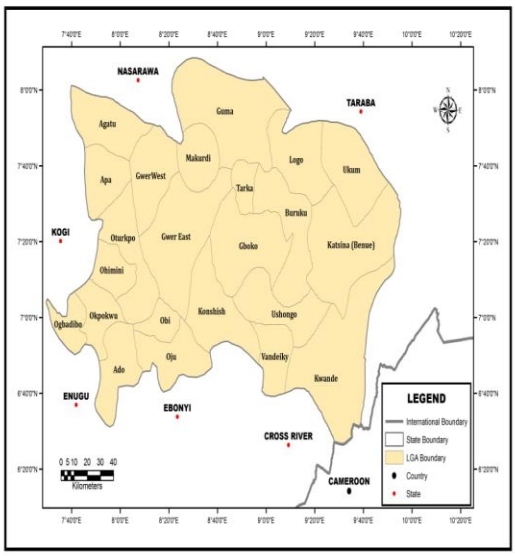

Figure 2: The map of Benue State

Ordinary Least Square Regression

The OLS was used to assess the welfare determinants of CAY- and NRCRI-seed yam farming households. The OLS regression was deemed appropriate because the data met the OLS assumptions. The model was also adopted because of the presence of the least variance as compared to other unbiased or linear regression models (Zhu, 2022). Likewise, in measuring welfare theoretically, household consumption of food and non-food expenditure was used as a proxy for welfare indicators (Eneji *et al.*, 2018). The implicit equation is stated as follows:

$$Y = a + bx \quad (1)$$

In explicit form, the equation according to Ademiluyi (2014) is stated as:

$$Y = \beta_0 + \beta_1 F_I + \beta_2 F_2 + \beta_3 F_3 + \beta_4 F_4 + \beta_5 F_5 + \beta_6 F_{6\ldots} \beta_{11} F_{11\ldots.} + (V_i - U_i) \quad (2)$$

Where:
Y=Welfare (food expenditure + non-food expenditure) (Naira)
F_1= Household Size (Number of Persons)
F_2= Farming Experience (Years)
F_3= Years of Schooling (Years)
F_4= Source of Finance (Personal=1, Family Members=2, Bank=3, Cooperative=4, Money Lender=5)
F_5=Access to Credit (Yes=1, No=0)
F_6= Farm Size (Hectares)
F_7= Secondary Occupation (Farming=1, Fishing=2, Artisan=3, Civil Servant=4, Others=5)
F_8= Household land ownership (Yes=1, No=0)
F_9= Cooperative Membership (Yes=1, No=0)
F_{10}=Land Source (Inherited=1, Purchased =2, Leased=3)
F_{11}= Extension Service (Yes=1, No=0)
δ_o=constant term
β_1- β_{11}=coefficient.

Weighted Average Index

This study made use of the weighted average index (Likert type scale) to examine the constraints to the usage of seed yam technologies for CAY- and NRCRI - seed yam farmers. A four-point scale was used to rate the responses of the seed yam farmers with the scoring order of 3, 2, 1 and 0 as very high, high, little, and 'not at all' respectively (Falola, *et al.*, 2017). A weighted average index (WAI) was estimated as follows:

$$WAI == \frac{F3W3+F2W2+F1W1+F0W0}{F3+F2+F1+F0} \quad (3)$$

$$WAI == \sum \frac{FiWi}{\sum Fi} == \frac{WI}{\sum Fi} \quad (4)$$

Where:
F = frequency
Wi = weight of scale
i = individual scale
WI = weighted index

3. RESULTS AND DISCUSSION

The results of the socioeconomic characteristics of seed yam farming households are presented in Table 1. Table 1 revealed that the mean age for NRCRI–seed yam farmers was approximately 51 years while CAY-Seed yam farmers was 43 years. This means that NRCRI seed yam farmers were quite older than CAY-Seed yam farmers. This may have affected their level of productivity because farmers who are older and well advanced in age may not be proactive in adopting new technologies and this may affect their efficiency. The Table further revealed that the two categories of farmers had similar household sizes. For instance, CAY-Seed yam farmers had a mean household size of 9 while NRCRI seed yam farmers had a mean household size of approximately 9. This implies that seed yam farmers may have ready access to family labour since both sets of farmers had relatively large household sizes. The findings of Esiobu, Nwosu, and Onubuogu (2014) discovered that large households often engaged in farm labour to aid production and thus, reduced hired labour costs. Similarly, NRCRI-Seed yam farmers had more years of schooling than their CAY-Seed yam counterparts while CAY-Seed yam farmers were observed to have more years of farming experience. This may imply that both categories of farmers were exposed to one form of education or another. (Esiobu *et al.*, 2014) explained that having access to high levels of education is of great benefit in terms of attaining increased production output. In

addition, Table 1 further revealed that the farm size for NRCRI-Seed yam farmers was higher than the farm size of CAY-Seed yam farmers. NRCRI had approximately 18 years of farming experience while CAY-Seed yam farmers had farming experience of 23.63 years. This may have an impact on the number of outcomes of seed yam farmers.

Table 1: The Socioeconomic Characteristics of Seed Yam Farming Household

	Observations	Mean	Standard Error	Standard Deviation
Age	150 (NRCRI)	50.94	0.72	8.76
	133 (CAY-SEED)	43.44	0.86	9.98
Household	150 (NRCRI)	8.64	0.52	6.36
	133 (CAY-SEED)	9.27	0.38	4.47
Farm Experience	150 (NRCRI)	18.17	0.81	9.87
	133 (CAY-SEED)	23.63	0.82	9.47
Years of Schooling	150 (NRCRI)	11.63	0.33	3.99
	133 (CAY-SEED)	6.52	0.28	3.23
Total Farm Size	150 (NRCRI)	3.51	0.16	1.95
	133 (CAY-SEED)	2.36	0.12	1.43

Source: Field Survey, 2020.

Welfare Determinants of Seed Yam Farming Households

The Ordinary least square regression was used to analyse the welfare determinants of seed yam farming households. Table 2 shows the estimates of the ordinary least square regression for the pooled result. The data for both sets of farmers were pooled to get a holistic perspective of the welfare determinants. The result of the F test revealed that the model was statistically significant at 5% ($p < 0.05$). Also, the explanatory variables included in the model accounted for about 28.31% variations in the welfare of seed yam farming households. For the welfare determinants of seed yam farmers, six explanatory variables were significant. The welfare determinants estimates were significant at 5% ($p < 0.05$) and include years of schooling, access to credit, farm size, source of labour, and extension service.

Table 2 showed the estimates of the ordinary least square regression for the pooled result. Six explanatory variables were significant for welfare determinants estimates and they were significant at 5% ($p < 0.05$). They include years of schooling, access to credit, farm size, source of labour, and extension service. The coefficient of household size (0.0061) was positive and significant at 5% ($p < 0.05$). This implies that the larger the household size, the higher the welfare of the farming household. This could be because members of the households that engage in other forms of farm and off-farming activities will improve the welfare of farming households. The coefficient of years of schooling (-0.0105) was found to be negative and significant at

5% ($p < 0.05$) for seed yam farming households. This indicates that as the years of schooling increase, seed yam farming households would tend to have poorer welfare. This is maybe because of the seed yam farming households not adequately applying knowledge gained from years of schooling to their farming activities. The finding was not consistent with the findings of Ademiluyi (2014) who stated that the more year of schooling a farmer has the better the welfare of the farmer.

The coefficient of access to credit (-0.1557) was found to be negative and significant at 5% ($p < 0.05$) for seed yam farming households. Thus, implies that as seed yam farmers have access to more credit, they would have less access to better forms of welfare. This could be because of the farming households not appropriately utilizing the credit obtained. This result is supported by Amanullah *et al.,* (2020) who stated that access to credit can have a negative effect on farmers' welfare. The coefficient of the source of farm size (0.0504) was found to be positive and significant at 5% ($p < 0.05$) for seed yam farming households. Thus, implies that as seed yam farmers have access to larger farmlands, they may have more opportunities to access better forms of welfare. This could mean those seed yam farmers who use their farmland to engage in more agricultural activities would increase their income and welfare over time. This finding is in sync with Ademiluyi (2014) who stated that the larger the farm size, the higher the likelihood of improving the welfare status of the household, other things being equal.

The coefficient of the source of labour (0.0558) for seed yam farming households was positive and significant at 5% ($p < 0.05$). This indicates that as seed yam farming households have access to more than one source of labour, their chances of having better forms of welfare increase. This finding is in line with Wossen *et al*., (2017) who explained that having more sources of labour influences the welfare of farmers positively. The coefficient of extension service (0.1031) was found to be positive and significant at 5% ($p<0.05$) for seed yam farming households. This denotes that when farming households have more access to extension services, seed yam farming households may have access to better forms of welfare because extension agents adequately pass on current information on improved methods of farming.

Constraints to the Usage of Seed Yam Technology by CAY- and NRCRI-Seed Yam Farmers

The result of the constraints faced by CAY- and NRCRI - seed yam farmers in the usage of seed yam technologies is presented in Tables 3 and 4 respectively.

Table 3 shows the result of the weighted average index of constraints faced by CAY-Seed yam farmers to the usage of the seed yam technologies. From the tables, it can be observed that the weighted index percentage (43%) for crop and field management was ranked first. The second constraint faced the CAY-Seed farmers in using the seed yam technology was access to the market (31%). The third constraint was pest management (12%). The fourth constraint facing CAY-Seed yam farmers was access to extension

service (10%) while the last ranked constraint to the usage of seed yam technologies was the availability of seed yams (4%).

Table 2: Welfare Determinants of Seed Yam Farming Households

Variable	Coefficient	Standard Error	P-value
Household Size	0.0061**	0.0030	0.044
Farm Experience	0.0047**	0.0016	0.004
Years of Schooling	-0.0105**	0.0038	0.006
Source of Finance	0.0181	0.0164	0.270
Access to Credit	-0.1557**	0.0441	0.001
Farm Size	0.0504**	0.0092	0.000
Sec. Occupation	0.0019	0.0094	0.833
land ownership	0.0711	0.1127	0.529
Cooperative	-0.0151	0.0396	0.702
Land source	0.0223	0.0368	0.952
Source of labour	0.0558**	0.0248	0.025
Extension service	0.1031**	0.0484	0.034
Constant	5.2488**	0.1529	0.000
R^2=0.2831			
Prob>F=0.000			

Source: Field Survey, 2020. **Note: ** = 5% significance level**

Table 3: Constraints to the Usage of Seed Yam Technology by CAY-Seed Yam Farmers

Variable	3	2	1	0	Weight	Weight index Average	Percentage index (%)	Rank
Availability of Seed Yam	5	14	75	571	118	0.1774	4	5th
Pest Management	26	59	112	468	308	0.4631	12	3rd
Crop and Field Management	214	190	131	130	1,153	1.1090	43	1st
Market	90	143	278	154	834	0.9616	31	2nd
Extension Service	41	25	79	500	272	0.8294	10	4th
Total	**376**	**431**	**675**	**1,823**	**2,685**	**3.5405**	**100**	

Source: Field Survey 2020

Table 4: Constraints to the Usage of Seed Yam Technology by NRCRI Seed Yam Farmers

Variable	3	2	1	0	Weight	Weight index Average	Percentage index (%)	Rank
Availability of Seed Yam	93	264	327	66	1,134	1.512	18.1	3rd
Pest Management	101	204	332	113	1,043	1.391	16.6	5th
Crop and Field Management	357	215	132	46	1,633	2.177	26.0	1st
Market	197	316	178	59	1,401	1.868	22.3	2nd
Extension Service	113	267	200	170	1,073	1.431	17.0	4th
Total	**861**	**1,266**	**1,169**	**454**	**6,284**	**8.379**	**100**	

Source: Field Survey 2020

Table 4 reveals that NRCRI seed yam farmers faced some constraints to the usage of seed yam technologies. The first constraint to the usage of seed yam technologies by NRCRI seed yam farmers was crop and field management (26%). The second constraint was access to the market (22.3%). Availability of seed yams (18.1%) was the third constraint faced by NRCRI seed farmers. Conversely, the fourth weighted ranked constraint faced by NRCRI seed yam farmers was access to extension service (17%). The last constraint was pest management (16.6 %).

In Tables 3 and 4, CAY- and NRCRI-seed yam farmers both faced the challenge of crop and field management as the most important constraint. Similarly, the market for produce and access to extension services were also very important constraints for both sets of farmers. However, the constraint of availability of quality seed yams affected the NRCRI seed yam farmer but was not so much a constraint for the CAY-Seed yam farmers. Similar studies done by Manyong *et al.*, (2001) noted that weeding is a major issue in seed yam production because weeds usually grow under conditions where stakes are used due to the low canopy cover. Studies by Ayanwuyi *et al.*, (2011) and Klein *et al.*, (2012), noted that poor road networks, a dearth of improved yam varieties and high labour costs were major constraints to productivity. Sanusi and Salimonu (2006) also concurred that most farmers faced similar challenges like the availability of seeds and poor knowledge of crop and field management.

4. CONCLUSION

The introduction of the CAY- and NRCRI seed yam intervention programmes were aimed at improving the availability of quality seed yams. This action was meant to also improve the welfare and food security status of seed yam farmers. The pooled result for the determinants of welfare estimate revealed

that years of schooling, household size, access to credit, farm size, source of labour and extension service significantly influenced the welfare of seed yam farmers. Consequently, results showing the constraints to the usage of seed yam technologies by CAY-Seed yam farmers indicated that crop and field management was the first constraint facing seed yam farmers while the last ranked constraint to the usage of seed yam technologies was the availability of seed yams. Accordingly, the results of the constraints to the usage of seed yam technologies for NRCRI seed yam farmers revealed that the first ranked constraint to the usage of seed yam technologies by NRCRI seed yam farmers was crop and field management while the last constraint faced by NRCRI seed yam farmers was access to extension agents and the last constraint was pest management. The study concludes that access to credit and the years of schooling for the seed yam farmers did not improve their welfare. However, land and labour availability and access to extension services helped to improve the seed yam farmers' welfare. The study recommends that seed yam farmers take up agricultural technologies made available to them. Similarly, land, labour and extension services should be made readily available for seed yam farmers which would help to improve their welfare status. Similarly, Seed yam farmers should also be trained in crop and field management while quality seed yams should be made available for NRCRI seed yam farmers.

REFERENCES

Adams, R.H. and Paje, J. (2003). Impact of International Migration and Remittances on Poverty, A Paper Presented at the DFI/WB Conference on Migrant Remittance London. 9-10.

Ademiluyi, I. O. (2014). Determinants of Smallholder Farmers' Welfare in Plateau State. Nigeria. *International Journal of Innovative Agriculture & Biology* Research 2 (4): 11- 16.

Amanullah, G. R. L., Siraj, A. C., Habibullah, M., Mansoor, A. K., Jing, W. and Naseer, A. C., (2020). Credit constraints and rural farmers' welfare in an agrarian economy, Heliyon, 6(10): 1. https://doi.org/10.1016/j.heliyon.2020.e05252.

Ayanwuyi, E., Akinboye, A. O. and Oyetoro, J. O. (2011). Yam production in Orire local government area of Oyo State, Nigeria: farmers perceived constraints. *World Journal of Young Researchers*, 1(2): 16–19.

Bassey, E. E. (2017). Constraints and Prospects of Yam Production in Nigeria. *European Journal of Physical and Agricultural Sciences* (5)1: 2017 ISSN 2056-5879 Progressive Academic Publishing, UK Page 55 www.idpublications.org.

Bruck, T, (2003). Household Cropping Choice and the Determinants of Income and Consumption in Post-War Rural Mozambique. A Paper Submitted at the European Economic Association Annual Meeting in Stockholm.

Ebele, F. U., Aregbesola, B. G., Haastrup, D. T. and Adams, E. (2014). The Effect of Climate Change on Agricultural Production Among Farmers in Kwali Area Council of Federal Capital Territory of Nigeria. Advances in Social Sciences Research Journal, 1(2): 13-26.

Eneji, R. I., and Mbeh, A.F. (2018). "Farmers' Perception of Poverty and Welfare in Boki Local Government Area of Cross River State, Nigeria." *International Journal of Research* - Granthaalayah, 6(7): 151-158. https://doi.org/10.29121/granthaalayah.v6.i7.2018.1293.

Esiobu, N.S., Nwosu, C.S., and Onubuogu, G.C. (2014). Economics of Pineapple Marketing in Owerri Municipal Council Area, Imo State, Nigeria. *Int. Journal. Appl. Res. Technology* 3(5): 3 – 12.

Falola, A., Salami, M.F., Bello, A. A. and Olaoye, T.A. (2017). Effect of Yam Storage Techniques Usage on Farm Income in Kwara State, Nigeria. *Agrosearch* 17 (1): 54-65. http://dx.doi.org/10.4314/agrosh.v17i1.554

Food Agricultural Organization, FAO (2017). The future of food and agriculture – Trends and challenges. Rome.

Idumah, F.O. and Owombo, P.T. (2019). Determinants of Yam Production and Resource Use Efficiency under Agroforestry System in Edo State, Nigeria. *Tanzania Journal of Agricultural Sciences*, 18(1): 35-42.

Ike, P. C. and Inoni, O. E. (2006). Determinants of yam production and economic efficiency among small-holder farmers in South-eastern Nigeria. *Journal of Central European Agriculture*, 7(2): 337–342.

Iris, L., Nicole, G., Jan, L., Jan, M., Boris, T., and Ricardo, V.C. (2018). Bioeconomy Shaping the Transition to a Sustainable, Bio-based Economy. Springer International Publishing, ISBN 978-3-319-68151.

Kabber, N, (2001). Conflict Over Credit-Re-Evaluating the Empowerment of Potential Loans to Women in Rural Bangladesh, 29:63-64.

Katung, P.S., Idem, N.U. A. and Onyibe, J.E. (2006). Yam, In: Idem, N.U. A and Showemino, F.A (eds) Tuber and fibre crops of Nigeria: Principles of production and utilization, Ade Commercial Press, Zaria, Nigeria, pp. 45-62.

Keyereme, S. and E. Thorbeeke (1991). Factors Affecting Food Poverty in Ghana. *Journal Development Studies*, 28:39-52.

Kleih, U. Phillips, D., Mignouna, D., Ogbonna, M., and Siwoku, B. (2012). Yam Improvement for Income and Food Security in West Africa Nigeria – Scoping Yam Value Chain Analysis.

Manyong, V.M., Asiedu, R. and Olaniyan, G.O. (2001). Farmers perception of and actions on, resources management constraints in the yam-based systems of Western Nigeria In: Akoroda, M.O. and Ngeve, J.M (compilers) Root Crops in the 21st century. Proceeding of the 7th Triennial Symposium of the International society for Tropical Root Crops-African Branch, held at the Centre of International Conferences, Cotonou, Benin, 11-17 October, 1998. 156-167.

Migap, J.P. and J S. Audu. (2012). Empirical study on yam cultivation and economic development of Taraba State: Case study of Wukari local government area. *Journal of Business and Organizational Development*. (4): 32–52.

National Bureau of Statistics (2016). Data on Nigerian Population.

National Population Commission of Nigeria (2016). Nigerian Population Census Data.

Olaniyan, O. (2000). The Role of Household Endowment in Determining Poverty in Nigeria. *Journal of Nigeria Economics Society.* (5): 1-22.

Quartey, P. (2005). The Impact of Migrant Remittances on Households Welfare Ghana, University of Legon. A Paper Submitted to the African Economics Resources Consortium (AERC) Nairobi, Kenya.

Sanusi, W.A. and Salimonu, K.K. (2006). Food Security among Households: Evidence from Yam Production in Oyo state, Nigeria. *Agricultural Journal*, 1(4): 249-253.

Ukoha, O. O., Mejeha, R. O. and Nte. I.N. (2007). Determinants of Farmers' Welfare in Ebonyi State, Nigeria. *Pakistan Journal of Social Sciences.* 4(3): 351-354.

Wossen, T., Abdoulaye, T., Alene, A., Haile, M., Feleke, S., Olanrewaju, A., and Manyong, V. (2017). Impacts of extension access and cooperative membership on technology adoption and household welfare. *Journal of Rural Studies*. 54: 223-233. 10.1016/j.jrurstud.2017.06.022.

Zhu, A. (2022). Linear Regression with OLS: Unbiased, Consistent, BLUE, Best (Efficient) Estimator. https://towardsdatascience.com/linear-regression-with-ols-unbiased-consistent-blue-best-efficient-estimator 359a859f757e#:~:text=An%20estimator%20that%20is%20unbiased%20and%20has%20the%20minimum%20variance,all%20linear%20and%20unbiased%20estimators.