# Assessment of the Constraints of Orange Flesh Sweet Potato Production in Awka South Local Government Area, Anambra State, Nigeria

*Okonkwo-Emegha K. and Obiekwe, N. J.*

*Department of Agricultural Economics and Extension, Nnamdi Azikiwe University Awka, Nigeria.*

**KEYWORDS**

*Assessment, Constraints, Orange flesh, Sweet potato, Production*

***CORRESPONDING AUTHOR**

*k.okonkwo-emegha@unizik.edu.ng*
*08035922432*

**ABSTRACT**

*This study was on constraints of orange flesh sweet potato production in the Awka South local government area of Anambra state. A multistage sampling technique was employed in the selection of location and respondents. The data were collected from 100 orange flesh sweet potato small holder farmers. The primary instrument used for data collected was structured questionnaire. Data obtained was analyzed with descriptive statistics and multiple regression analysis. Majority of the farmers are male (75.0%), with average age of 47 years. Majority (60.0%) of the farmers are married, greater proportion (56.0%) of the farmers have 16 years and above farming experience, (65.0%) of the farmers had secondary education, (57.0%) of the farmers have 6 – 10 people in their households, and majority (72.0%) have a farm size of 11 plots and above. The coefficient (1.048) of the Farm size was positive and significant at 5% level of probability. Age, household size, education, extension contact and access to credit have a positive influence on orange flesh sweet potato production at a 1% level of probability. The model's robustness, explaining 67.00% of profit variability, revealed the significance of these factors in shaping economic outcomes. Furthermore, the challenges faced by farmers, with their mean scores are as follows Low Capital (M = 3.10), far Distance from the Farm (M = 3.06), high cost of labor (M = 3.33), Attack of Pests and Diseases (M = 3.04), and Lack of Improved potato vines (M = 3.00). In conclusion, addressing these constraints through research and policy measures is crucial to enhancing the economic viability of orange flesh sweet potato production. The study recommended that there is need to improve the productivity of farmers by encouraging increased use of improved production technologies and availability of cheap credit to the producers.*

## INTRODUCTION

Orange flesh sweet potato (OFSP) is an important staple food crop for both rural and urban areas and occupies a strategic position for rapid food production in Nigeria. (Adeyemi, Sennuga, Alabuja and Osho-Lagunju, 2023). Orange fleshed sweet potato is an important food crop if widely cultivated and consumed would facilitate the eradication of malnutrition in children. It is beneficial to people who are down with illness like diabetes, cancer, anthriris, stomach ulcer; other functions include reduction of stress, eye sight improvement, boost fertility and help to prevent illness (Ume *et al*., 2020). This crop requires fewer input compared to the white potato and less labour not excluding its tolerant to marginal growing conditions than any other crop. It is a starch staple crop that contains ascorbic acid and amino acid (lysine) which is usually deficient in cereal diets. The variety grows in tropical and sub-tropical areas. This root crop produces large amount of food perunit time and area during rainy seasons and tolerates dry season and produces higher yield in less fertile soil more than many crops (Iheonu *et al*., 2023).

OFSP's orange color is a result of beta-carotene, which is then changed into vitamin A in the body for added nutritional value after ingestion. Bio-fortification increases a crop's concentration of vitamins and minerals using conventional plant breeding, agronomic methods, or biotechnology, improving the nutritional value of basic food crops. Pro vitamin A, carotenoids, zinc, and iron are some of the vitamins and minerals that can be boosted through bio-fortification (Oyewole and Sennuga, 2020).

Orange fleshed potato is a vegetable with sweet and carrot like taste; it's starchy and tuberous in nature. It yields better quality on well drained, light, sandy loam or silt loam soils. It requires a moderate temperature of 21-60$^{o}$c. It requires a well distributed rainfall 75-150 cm and can be sole crop and intercropped with other crop such as maize, orchard crops with aim of land and profit maximization. It can tolerate drought to some extent but do not withstand water logging. A well-drained loam and clay loam soil are good for sweet potato cultivation. Heavy clayey soil prevents storage root development as a result of compactness but sandy soil encourages long cylindrical pencil like root. Sweet potatoes thrive on acidic soil having a PH of 5.5-6.5 where as higher PH causes pox and scurf disease and lower PH level causes aluminum toxicity therefore sweet potato is sensitive to salinity and alkalinity.

OFSP does not require much fertilizer to grow but could be applied on soils that are not rich in nutrients and is advisable to apply organic fertilizer than an inorganic one. The planting material used for OFSP is vine cutting. Nigeria ranks second among countries that produce sweet potato in the world after China with an annual output of 3.46 annual million metric tons (Udemezue, 2019).

Several studies have been done on orange flesh sweet potato production by some of these researchers; According to Barnabas *et al*., (2023), in their research work, Gender participation of orange flesh sweet potato production activities in FCT, Abuja, Nigeria, found out that lack of finance, conflict with herdsmen, high cost of labour, high cost of vine, lack of storage facilities, and high cost of transportation were perceived as the most serious constraints encountered by orange flesh sweet potato production in the study area. Ume *et al*., (2020), in their study Economic Efficiency of orange flesh sweet potato (OFSP) varieties by farmers in Anambra state, Nigeria, found out that poor access to credit by the farmers, and extension service, high cost of labour, high cost of fertilizer, high cost of adulteration of pesticides, high cost of improved potato vines are the major constraints that affect the production of orange flesh sweet potato in the study area. Despite all these studies on orange flesh sweet potato production none of these studies have been able to establish the constraints encountered in orange flesh sweet potato production in Awka South Local Government Area of Anambra State. It is this gap that this study seeks to fill by assessing the constraints of orange flesh sweet potato production in Awka South local government area of Anambra state. The specific objectives of the study were to describe the socio-economic characteristics of orange flesh sweet potato producers; determine the factors influencing the production of orange flesh sweet potato and the constraints faced by the producers in the study area.

## METHODOLOGY

### The Study Area

The research area for this study is Awka South Local Government Area in Anambra State. Awka South is a local government area located in Anambra State, Nigeria. It is situated in the southeastern part of the country and is one of the 21 local government areas in Anambra State. The area serves as the capital of Anambra State, as it houses the administrative and governmental institutions of the state. Awka South Local Government Area (LGA) is made up of nine towns, namely, Amawbia, Awka, Ezinato, Isiagu, Mbaukwu, Nibo, Nise, Okpuno and Umuawulu. There are three major streets that span this area, which are the Zik Avenue, Works Road and Arthur Eze Avenue. In the past, the people of Awka South LGA were well known for blacksmithing. Today they are respected among the Igbo people of Nigeria for their technical and business skills.

The Awka South local government region has two distinct seasons, the wet and dry seasons, with an estimated total amount of precipitation of 2950 mm (Okonkwo-Emegha, 2023). The region's average temperature is 27 °C, with a 70% average humidity in Awka South. It is located between latitude 6.2069°N and longitude 7.0678°E. Awka South is the capital and administrative center of Anambra State. It is home to the state government offices, including the Governor's Office, State Secretariat, and various government agencies. Awka South is home to several educational institutions, including universities, colleges, and schools. The Nnamdi Azikiwe University, which is one of Nigeria's foremost federal universities, is located in Awka South. The presence of these educational institutions contributes to the intellectual and academic vibrancy of

the area. Awka South has a diverse economy with various economic activities. The area is home to a range of industries, including manufacturing, commerce, and services. There are markets, shopping complexes, and commercial centers where trade and business activities thrive. Awka South has its share of cultural and historical significance. The area has traditional festivals, cultural events, and historical sites that showcase the rich cultural heritage and history of the Igbo people. These events and sites provide opportunities for cultural exploration and appreciation. Awka South has a diverse economy with various economic activities. The area is home to a range of industries, including manufacturing, commerce, and services. There are markets, shopping complexes, and commercial centers where trade and business activities thrive.

**Sampling Procedure**

The population of the study comprises of all registered orange sweet flesh potato (1,003) farmers in the study area.

Multistage sampling procedure was used in selecting respondent for the study.

**In the first stage,** Awka South Local Government Area was purposively selected based on the dominance orange flesh sweet potato farmers.

**In the second stage,** 5 (five) communities (Awka, Amawbia, Nibo, Nise, and Okpuno) were randomly selected from the local government area.

**In the third stage,** from each of the selected 5 communities, 20 orange flesh sweet potato farmers was randomly selected. This gave a total of 100 respondents that were selected for the study.

**Data Collection**

Data for this study were derived from primary sources which include the use of structured questionnaire, personal interviews, observations and informal discussion. Structured questionnaire was used for literate farmers and interview schedules for the illiterate farmers. All the copies of the questionnaires were administered to the farmers.

**Data Analysis**

Descriptive statistics such as frequency, mean and standard deviation and multiple regression analysis was used.

**Model Specification**

The multiple regression model was used to analyse the factors influencing orange flesh sweet potato production. Age shown as (AGE), sex (SE), marital status (MAS), household size (HOS), farming experience (FE), education (EDU) and labour cost (LAC).

Y= f (AGE, SE, MAS, HOS, FE, EDU, LAC + e)……. (1)

Where:

**AGE =** Orange Flesh Sweet Potato farmers age in years
**SE =** Orange Flesh Sweet Potato farmers sex
**MAS =** Orange Flesh Sweet Potato farmers marital status
**HOS =** Household size (number of persons in the household)
**FE =** Farming experience
**EDU =** Education level of farmers (years of schooling obtained)
**LAC** = Labor cost
**e =** stochastic error term

**Factors influencing production**

In this study, the factors influencing production will be analyze using multiple regression analysis. The model will be implicitly specified as:

$Y = \beta 0 + \beta 1X1 + \beta 2X2 + ..... + \beta nXn + e$ (2)

Where:
Y = dependent variable
β0 = constant intercept
β1 – βn = parameter estimates (coefficients) X1 –Xn = independent variable
e = error term

## RESULTS AND DISCUSSIONS

### Socio-economic Characteristics of Small Scale Orange Flesh Sweet Potato Farmers

**Sex**: the study revealed that majority of the farmers (75.0%) are male, while the remaining 25.0% are female. This indicates males are more active in orange fleshed sweet potatoes production in the study area. The greater number of male farmers in the area may be attributed to the culture, traditions and belief of the people in the study area that farming activities involved hard task and that it is not proper for women to be involved in farming activities. This is in line with Onyegbula, (2017) who reported that male dominated in orange flesh sweet potato production. Age: The result shows that a greater proportion (47.0%) of the farmers are within the age range of 30 – 49 years. This result implies that farmers in the study area were in their prime ages. This trend has significant implication for innovativeness as elderly people might be less interested in the use of orange sweet flesh potato and adoption of new potato varieties other than the ones they are used to. Nwankwo and Bassey, (2019) finding gave credence to above affirmation. They opined that youthful farmers have long planning horizon and access to information aimed at improving their production efficiency. Marital status: the study revealed that the majority (60.0%) of the farmers are married. This indicates that farmers had families that could be used for labour and most likely needed to be aware of orange sweet flesh potato nutrients which are a vital source of vitamin A for children and adults. This outcome is consistent with Adeyongo *et al*. (2022) who in assertion that married farmers make up the majority of farming activities. This suggests that more couples were involved in orange sweet flesh potato production in the study area. The high level of couple's involvement in orange sweet flesh potato production may likely be as a result of high demand of labor for agronomic practices by the family to add up to the hired labour. This result is also in line with Olasunkami *et al*. (2020), who reported that more couples are involved in crop production.

Farming experience: The table revealed that a greater proportion (56.0%) of the farmers have 16 years and above farming experience. This signifies that the farmers are relatively experienced in the enterprise. This age of over a decade of experience in the agricultural sector will help the farmers implement the needed technical know-how to improve agricultural production. Similar report of Fawole (2018) showed that farmers were not new in sweet potato farming in Nigeria. Abiona (2020) opined that years of farming experience usually play a vital role in any farming enterprise. Level of education: the study shows that the education qualifications of the farmers are scattered across different levels, it was uncovered that most (65.0%) of the farmers had secondary education, 18.0% had tertiary education, 12.0% had primary education, 5.0% had a postgraduate degree. Adeola *et al*. (2019) found that formal education increased the adoption of improved sweet potato varieties among farmers in Nigeria. Household size: evidently, most (57.0%) of the farmers have 6 – 10 people in their households. This could connote that the farmers have access to labour, particularly the use of family labour in order to upset labour requirement for the farming especially during farming season when the wage rate is very expensive. Iheonu, Sennuga, Ezike, Funso, and Bankole, (2023) reported in their work that the average household size of orange flesh sweet potato farmers are 8 persons. Farm size: The result revealed that orange flesh sweet potato production is mainly on smallholding production, the farm size was measured in plots which the farmers are mostly conversant with. The study revealed that the majority (72.0%) have a farm size of 11 plots and above. This is in line with the report of Jenkins, Shanks, Brouwer, and Houghtaling, (2018) who stated that smallholder orange flesh potato operate mainly on the average farm size of 7 to 12 plots of land.

### Factors Affecting Sweet Flesh Potato Production

The factors affecting the orange flesh sweet potato production in the study area is presented in Table 2. The F-statistics value of 14.99(***) significant at a 1% level of probability measures the overall significance of the regression model. It implies that at least, one of the independent variable is affecting orange flesh sweet potato production in the area. R-square (0.667) and Adjusted R-square (0.631) values represent the goodness of fit of the regression model. An R-square of 0.667 suggests that approximately 67% of the variability in orange flesh sweet potato production can be explained by the included variables.

**Table 1: Socioeconomic characteristics of orange sweet flesh potato farmers**

| Socioeconomic characteristics | Frequency | Percentage (%) | Mean |
|---|---|---|---|
| Gender: | | | |
| Female | 25 | 25.0 | |
| Male | 75 | 75.0 | |
| Age: | | | |
| Less than 30 | 20 | 20.0 | |
| 30 – 49 | 47 | 47.0 | 47 |
| 50 and above | 33 | 33.0 | |
| Marital status: | | | |
| Single | 19 | 12.0 | |
| Separated | 3 | 3.0 | |
| Widow/widower | 25 | 25.0 | |
| Married | 60 | 60.0 | |
| Farming experience (years): | | | |
| Less than 6 | 4 | 4.0 | |
| 6 - 10 years | 24 | 24.0 | 18.02 |
| 11 - 15 years | 16 | 16.0 | |
| 16 years and above | 56 | 56.0 | |
| Level of education: | | | |
| No formal education | 5 | 5.0 | |
| Primary | 18 | 11.0 | |
| Secondary | 35 | 65.0 | |
| Tertiary | 28 | 18.0 | |
| Postgraduate | 14 | 1.0 | |
| Household size: | | | |
| Less than 6 people | 35 | 35.0 | |
| 6 - 10 people | 56 | 56.0 | 27 |
| Above 10 people | 17 | 23.0 | |
| Farm size (15 plot/ha): | | | |
| Less 6 | 9 | 9.0 | |
| 6 - 10 plots | 72 | 72.0 | |
| 11 plots and above | 19 | 19.0 | |

The coefficient (1.048) of the Farm size was positive and significant at a 5 level of probability, suggesting that there is a positive relationship between the farm size employed and orange flesh sweet potato production by 1.048 units of OFSP output. This implies that certain farm size contribute positively to production. The positive coefficient (0.043) of age indicates that age has a positive influence on orange flesh sweet potato production at a 1% level of probability. Older farmers may have more experience or accumulated knowledge, contributing to higher production by 0.043 units of OFSP output.

The positive coefficient of 0.178 of household size at a 1% level of probability suggests that household size has a significant positive impact on orange flesh sweet potato production by 0.178 units of OFSP output. Farmers have access to labor, particularly the use of family labor in order to upset labor requirement for the farming especially during farming season when the wage rate is very expensive per unit output.A positive coefficient (0.128) of education at a 1% level of probability suggests that higher levels of formal education are associated with increased orange flesh sweet potato production by 0.128 units output. Education may contribute to better decision-making and adoption of advanced agricultural practices.

The positive coefficient (0.011) of access to credit at a 1% level of probability indicates that increased access to credit has a positive impact on orange flesh sweet potato production by 0.011 units of OFSP output. When farmers have access to credit it increase yield. Furthermore, the regression results suggest that several factors significantly affect orange flesh sweet potato production in the study area. Positive coefficients for the farm size, age, household size, years of formal education, and access to credit imply that these factors contribute positively to orange flesh sweet potato production. This agreed with Nwakor, (2021), who asserted that age, educational level, farming experience, membership of organization, and access to extension services contribute positively to orange flesh sweet potato production.

**Table 2: Factors affecting orange flesh sweet potato production in the area**

| Covariates | Coefficients | Standard Error | t-Statistics |
|---|---|---|---|
| Intercept | 6.698 | 1.148 | 5.84 |
| Farm size | 1.048 | 0.423 | 2.48** |
| Age | 0.043 | 0.015 | 2.85*** |
| Household size | 0.178 | 0.034 | 5.26*** |
| Years of formal education | 0.128 | 0.029 | 4.43*** |
| Farming experience | 0.053 | 0.046 | 1.15 |
| Extension contacts | 0.103 | 0.069 | 1.49 |
| Fertilizer usage | -0.499 | 0.414 | -1.20 |
| Access to Credit | 0.011 | 0.002 | 5.63*** |
| F-statistics | 14.99*** | | |
| R-square | 0.667 | | |
| Adjusted R-square | 0.631 | | |
| Obs. | 100 | | |

Source: Field Survey, 2024. Sig. @ 10% (*), 5% (**), 1% (***)

**Constraints Faced by Orange Flesh Sweet Potato Producers**

The constraints faced by orange flesh sweet potato farmers is presented in Table 4.4. The data were collected using a 5-point Likert scale, where variables with a mean score of 3.0 and above are considered to agree with the constraints, while those below 3.0 are considered to disagree. The decision level is set at 3.0, suggesting that items with mean scores at or above this threshold are perceived as constraints to orange flesh sweet potato production. The grand mean of 3.21 indicates that, on average, the majority of the items are perceived as constraints to orange flesh sweet potato production. The grand standard deviation value of 1.26, being greater than 0.5, suggests variability in farmers' responses, indicating diverse opinions among respondents.

**Table 3: Constraints faced by orange flesh sweet potato producers**

| Challenges | Mean | Std. Dev | Decision |
|---|---|---|---|
| Low capital | 3.10 | 1.382 | Agree |
| A far distance from the farm | 3.06 | 1.441 | Agree |
| High cost of labour | 3.33 | 1.382 | Agree |
| Attack of pests and diseases | 3.04 | 1.455 | Agree |
| Inadequacy of farmland | 2.76 | 1.305 | Disagree |
| Inadequate storage facilities | 2.77 | 1.441 | Disagree |
| Inadequate extension services | 2.73 | 1.272 | Disagree |
| Lack of improved potato vines | 3.00 | 1.407 | Agree |
| Poor transportation facilities | 4.12 | 0.803 | Agree |
| High cost of inputs | 3.43 | 1.142 | Agree |
| Poor acceptability | 3.94 | 0.810 | Agree |
| **Grand mean** | 3.21 | 1.26 | Agree |

Source: Field Survey, 2024.

**Challenges Identified**

Low Capital (M = 3.10): Orange Flesh Sweet Potato producers perceive low capital as a constraint, with a mean score slightly above the decision level. This suggests that farmers see insufficient funds as a hindrance to their production activities. Far Distance from the Farm (M = 3.06): Proximity or accessibility to farms is considered a challenge, but the mean score is relatively close to the decision level. High Cost of Labor (M = 3.33): The mean score of 3.33 indicates that farmers feel dissatisfied with the cost of labor for their orange flesh sweet potato produce. Attack of Pests and Diseases (M = 3.04): Pests and diseases are perceived as a constraint, though the mean is just above the decision level. Lack of Improved potato vines (M = 3.00): The absence of improved potato vines is considered a constraint, emphasizing the need for research and development in breeding better potato vines. Agbarevo, and Okringbo, (2020) stated that inadequate fund, high cost of inputs, limited access to credit among others hinders farmers from getting the necessary resources and technologies which assist them to produce efficiently and remain in production. The implication is that

farmers depend wholly on their small personal savings to finance their production activities which usually makes them unable to adopt technologies disseminated in the area as well as attaining large scale production.

## CONCLUSION

Conclusively, male farmers dominated the enterprise with an average young age suggesting a physically capable and technologically adaptable group. Poor transportation facilities and low capital pose as the main constraints confronted by the respondents. The identified challenges can easily be solved with the adoption of the following suggestions: There is need for labor saving devices to be developed through cooperative societies in order to reduce cost of labor; there is need for government agencies concerned to help in the multiplications of the OFSP vines through establishment of multiplication centers in every community in the study area to enhance farmers' access; and rrecognizing pests and diseases as perceived constraints, there is a need for effective pest and disease management strategies. This can include providing farmers with training on integrated pest management practices, supplying disease-resistant cassava varieties, and disseminating information on best practices for maintaining crop health.

## REFERENCES

Adeola, R. G., Ogunleye, K. Y., and Adewole, W. A. (2019). Adoption intensity determinants for improved sweet potato varieties among farmers in Nigeria. *International Journal of Agricultural Management and Development* (IJAMAD), 9(1047-2019-3477), 203-211.

Adeyemi, S. O., Sennuga, S. O., Alabuja, F, O. and Osho-Lagunju, B. (2023). Technology Usage and Awareness among Smallholder Farmers in Gwagwalada Area Council, Abuja, Nigeria. Direct *Research Journal Agriculture Food Science*, 11(3); 54-59.

Adeyongo, I. L., Chibuike, F., Sennuga, S. O. and Alabuja, F. O. (2022): Adoption of Agricultural Innovations among Rice Farmers in Federal Capital Territory, Nigeria. *International Journal of Agriculture Extension and Social Development. 10(6): 12-19.*

Adedayo, A., and Tunde, A. M. (2013). Challenges of women in urban agriculture in Kwara State, Nigeria. Sustainable Agriculture Research, 2(526-2016-37773).

Adepoju, A.A, Raufu, M.O, Sanusi, W.O and Onabamji, O.A (2017). The Effect of Bio-fortified Orange Fleshed Sweet Potato A doption on Farming Household Welfare in Osun State Nigeria. *International Journal of political science and Development. 5(4):145-155.*

Adesina, B. A., Abdurrasheed, M. D., Okoye, A. C., Ekah, E. O., Anedo, E. O., and Afuape, S. (2017). Farmers' willingness to pay for quality orange fleshed sweetpotato (OFSP) vines in North Central Nigeria: A case of Benue and Nasarawa States. *Nigeria Agricultural Journal, 48(1), 110-121.*

Agbarevo, M. B., and Okringbo, J. I. (2020). Effect of Technologies of National Root Crops Research Institute, Umudike on Poverty Reduction among Farmers in Umuahia Agricultural Zone, Abia State. *Journal of Community and Communication Research, 5(1), 84-90.*

Akinbile, C. O. (2010). Behavioural pattern of upland rice agronomic parameters to variable water supply in Nigeria. *Journal of Plant Breeding and Crop Science, 2(4), 073-080.*

Akinsanola, A. A., and Ogunjobi, K. O. (2014). Analysis of rainfall and temperature variability over Nigeria. *Global Journal of Human-Social Science: B Geography, geo-sciences, environmental disaster management, 14(3), 1-17.*

Alalade, O. A., Oladunni, O. A., Adisa, R. S., Olayode, O. O., and Paul, A. B. (2019). Effect of value addition on farm income of sweet potato farmers in Kwara State, Nigeria. *Journal of Agricultural Extension*, 23(4), 92-98.

Ani, E. I. (2013). Africa and the prospects of deliberative democracy. *South African Journal of Philosophy, 32(3), 207-219.*

Babatunde, R. O., Omoniwa, A. E., and Adeniyi, A. E. (2019). Orange fleshed sweet potatoes (OFSP) and productivity: the case of smallholders in Kwara State, Nigeria. *Agricultural Tropica et Sub tropica, 52(3-4), 105-111.*

Bamiro, O. M., and Aloro, J. O. (2013). Technical efficiency in swamp and upland rice production in Osun State. *Scholarly Journal of Agricultural Science*, 3(1), 31-37.

Bergh, K., Orozco, P., Gugerty, M. K., and Anderson, C. L. (2012). Sweet potato value chain: Nigeria. Evans School Policy Analysis and research (EPAR). Brief, (220).

Bose, A. A., Jatbong, J. N., Danwanka, H. A., and Dalhatu, A. (2020). Factors influencing gross income on sweet potato production in Toro local government area of Bauchi State, Nigeria. *International Journal of Agricultural Research and Food Production, 5(2), 18-35.*

Chah, J. M., Anugwa, I. Q., and Nwafor, I. M. (2020). Factors driving adoption and constraining the non-adoption of biofortified orange fleshed sweet potatoes (OFSP) among farmers in Abia State, Nigeria. *Journal of Agriculture and Rural Development in the Tropics and Subtropics* (JARTS), 121(2), 173-183.

Chilala, A., and Kajoba, G. M. (2017). Diffusion of orange fleshed sweet potatoes by smallholder farmer households in Petauke Distric, Zambia. *American Journal of Environmental Protection, 5(1), 13-19.*

Ekenta, C., Mohammed, A. B., Afolabi, O. K., and Owolagba, E. F. (2012). Maize in Livestock Foods in Kogi State: Analysis of Livestock Food Security Gap.

Ginting, E., and Yulifianti, R. (2015). Characteristics of noodle prepared from orange-fleshed sweet potato, and domestic wheat flour. Procedia Food Science, 3, 289-302.

Iheonu, M. E., Sennuga, S. O., Ezike, D. N., Funso, O., and Bankole, A. O. L. (2023). Communication Methods' Efficacy in Getting Smallholder Farmers to Embrace Orange Fleshed Sweet Potato (OFSP) Technology in Gwagwalada, FCT, Nigeria. *Direct Research Journal of Agriculture and Food Science*, 11(3), 67-77.

International Development USAID (2016). Orange-fleshed sweet potatoes: Improving lives in Uganda. Retrieved 23 Nov 2022 from https://www.usaid.gov/results-data/success-stories/orangefleshedsweet-potatoes improving-lives-uganda.

Jenkins, M., Shanks, C. B., Brouwer, R., and Houghtaling, B. (2018). Correction to: Factors affecting farmers' willingness and ability to adopt and retain vitamin A-rich varieties of orange-fleshed sweet potato in Mozambique. Food Security, 10, 1521-1523.

Kaguongo, W., Ortmann, G., Wale, E., Darroch, M., and Low, J. W. (2012). Factors influencing adoption and intensity of adoption of orange flesh sweet potato varieties: Evidence from an extension intervention in Nyanza and Western provinces, Kenya. *African Journal of Agricultural Research.*

Low, J. W., Mwanga, R. O., Andrade, M., Carey, E., and Ball, A. M. (2017). Tackling vitamin A deficiency with bio fortified sweet potato in sub-Saharan Africa. Global food security, 14, 23-30.

Mbanaso, U., Chukwudebe, G., and Atimati, E. (2015). Nigeria's evolving presence in cyberspace. *The African Journal of Information and Communication*, 2015(15), 106-113.

Mbanaso, E. O., Agwu, A. E., Anyanwu, A. C., and Asumugha, G. N. (2012). Assessment of the extent of adoption of sweet potato production technology by farmers in the southeast agro ecological zone of Nigeria. *Journal of Agriculture and Social Research* (JASR), 12(1), 124-136.

Mignouna, B., Manyong, M. Rusike, J. Mutabazi, S. and Senkondo, M. (2011). Determinants of adopting.Imazapyr-Resistant maize Technology and its impacts on household income in Western Kenya. AgBioforum. 14(3): 158-163.

Nwakor, F. N. (2021). Assessment of the Level of Orange Fleshed Sweet Potato Production among Small Scale Women Farmers in Abia State, Nigeria. *Nigeria Agricultural Journal*, 52(3), 325-331.

Nwankwo, I.I.M., Ikoro, A.I., Akinbo, O.K., Okeagu, O.D. and Korieocha, J.N., (2019). History of Development and Impact of Orange Fleshed Sweet potato varieties in Nigeria-A Review. *International Journal of Agricultural Research, Sustainability, and Food Sufficiency* (IJARSFS). 6(4):386-401

Nwosu, K.I. (2012). Agriculture rebirth for improved production in Nigeria. A key note paper that was presented at the 39th annual conference of the Agriculture Society of Nigeria, University of Benin, Nigeria.

Nnaji, J. O., Okonkwo, K. E., Abdulshakur, M. M., Yusuf, A. A., and Olanipekun, O. A. Comparative Analysis of Gender Participation in Rice (Oryza Sativa) Production In Enugu State, Nigeria.

Ochei, M. C., Orisakwe, I. C., and Oluleye, A. (2015). Spatial, seasonal and inter-seasonal variations of thunderstorm frequency over Nigeria. *African Journal of Environmental Science and Technology*, 9(12), 810-833

Orinda, M. A. (2013). Analysis of factors influencing sweet potato value addition amongst smal.lholder farmers in Rachuonyo South District, Kenya (Doctoral dissertation, Egerton University).

Onyegbula, C. B. (2017). Rice farmers' perception of effects of climate change on rice development stages in Niger State. *Journal of Agricultural Extension and Rural Development, 9(2), 14-19.* (2022-08-31). "Towns and Villages in Akwa South « Anambra State « Nigeria". Towns and Villages. Retrieved 2023-06-25.

Williams, D. J., Edwards, D., Hamernig, I., Jian, L., James, A. P., Johnson, S. K., and Tapsell, L. C. (2013). Vegetables containing phytochemicals with potential anti-obesity properties: A review. *Food Research International, 52(1), 323-333.*

World Bank. (2019). Employment in agriculture (% of total employment) (modeled ILO estimate). Nigeria, Media (2018-04-18). "List of Towns And Villages In Awka South L.G.A, Anambra State". Media Nigeria. Retrieved 2023-06-25. Anambra State – SEREDEC". Retrieved 2023-06-25.

Van den Ban and Hawkins H.S. (2010). Agricultural extension.2nd Edition; Blackwell Science, Oxford Publishers, London, Pp 267-268.