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ADOPTION OF IMPROVED FARMING PRACTICES BY FLUTED PUMPKIN FARMERS IN SELECTED ADP ZONES, ADAMAWA STATE, NIGERIA

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ABSTRACT

The study analyzed the adoption of improved recommended practices of fluted pumpkin by farmers in selected ADP Zones, Adamawa State, Nigeria. Six blocks (Three from Zones III and IV) were purposively selected based on their high involvement in fluted pumpkin farming with; 192 commercial fluted pumpkins farmers selected through snowball technique. Data for the study were collected using questionnaire which were analyzed using descriptive and inferential statistics. Results showed that most (85.4%) of the respondents were male with mean age of 37 years, educated (78.1%) and cultivated average of 1.6 hectares. The majority (80.2%) of the respondents sourced their information through friends and neighbours. Staking (99%), seed selection (95.8%), irrigation (100%) and harvesting (100%) were the recommended practices mainly adopted by the farmers. The study also revealed that poor provision of extension services (99%), high cost of inputs (85.4%) and poor road network (68.8%) were the major constraints faced by the respondents. Multiple regression analysis gave R^2 of 0.57 indicating that 57% of the relationships were as a result of dependent variables in the model. It also revealed that, the coefficients of educational status (2.295), household size (1.901), Experience (2.407) and income (2.502) were positive and significant at 5% level. It was concluded that fluted pumpkin farming were mostly undertaken by male farmers that are in their active age and attended formal education. They cultivated an average farm size of 1.6 hectares with average household size of 7 people and were constrained by inadequate fund but had formal education which enables them to adopt and utilised recommended improved technologies. The study recommended that farmers growing fluted pumpkin should be sensitized on how to form agricultural cooperatives association for collective bargaining in acquiring loans.

Keywords: Adoption, Fluted Pumpkin, Practices.

INTRODUCTION

Fluted pumpkin (*Telfairia occidentalis*) is a tropical vine, grown in West Africa as a leaf vegetable and for its edible seeds (fluted guard). It is one of the most important vegetable in Nigeria belonging to *cucurbitaceae* family (Opajobi, Esume, Osasuyi and Okehie, 2011). Fluted pumpkin comes first in the indigenous vegetable crops priority rating of south-eastern Nigeria and is believed to have originated there (Badifu and Ogunsina, 1991). The leaf is rich in minerals (Iron, Potassium, Sodium, Phosphorus, Calcium and Magnesium), antioxidants, vitamins (thiamine, riboflavin, nicotinamide and ascorbic acids) and phyto-chemicals such as phenols (Fasuyi, 2006). The amino acid profile of Fluted pumpkin has also been shown to be very rich and includes alanine, aspartate, glycine, glutamine, histamine, lysine, methionine, tryptophan, cysteine, leucine, arginine, serine, threonine, phenylalanine, valine, tyrosine and isoleucine (Fasuyi, 2006). The fruit case and pulp of Fluted pumpkin which constitute 64% of whole fresh fruit weight can be used as feedstuff for livestock (Essien, Ebang and Udo, 1992; Egbekan, Nda-Sulaiman and Akinteye, 1998). The vegetable provides an appreciable cash income to small farm families (Akoroda, 1990). The seeds are eaten roasted, boiled or ground to paste as soup thickener (Eleke, 2004).

Fluted pumpkin production and consumption has gained popularity in many other parts of Nigeria because of its medicinal, economic and

nutritive value (Ugwu, 2001). The crop forms one of the major components of human diet in many parts of Nigeria (Achinewhu and Isichei, 1990). Medicinally, the leaves and juice are recommended for pregnant women, lactating mothers and for the prevention of anaemia (Umeha, 2002). It also helps to solve gynaecological problems. These justify the apparent increase in its production in Nigeria. Food and Agriculture Organisation (FAO, 2002) noted that a non-wood crops are essentially part of the local subsistence economies but has not received the required attention. This is attributable to lack of awareness, poor production and marketing strategies, provision of technical advice on important issues which will help to reposition farmers to address the challenges of production and efficient marketing of the crops (Chah, Abugu, Nwobode, Asadu, and Igbokwe, 2013). It is widely acknowledged that efficient utilisation of production inputs and adherence to recommended production practices is the heart of successful agricultural production. This is because; the scope of agricultural production can be expanded and sustained by farmers through efficient utilisation of recommended production practices (Ali, 1996; Udoh, 2005). According to Francisca and Eyzayuirre (2006) increase in vegetable production could improve food security and offered employment opportunities to many unemployed people in Nigeria.

One of the major vegetable crops produced in Adamawa State is fluted pumpkins which represent

an essential part of the agricultural products in the state. Producers now see its production as a viable business and produce it all year round. However, the crop has not been given much attention in research nor promoted as a viable enterprise particularly in the State (Ogusi, Begho and Ewolor, 2014). This necessitated the study of adoption of improved farming practices in order to inform the development of appropriate policy interventions for improved pumpkin production.

The main objective of the study was to analyze the adoption of improved fluted pumpkin practices among farmers in selected ADP Zones in Adamawa State, Nigeria. The specific objectives of the study were to:

- i. describe the socioeconomic characteristics of respondents in the study area;
- ii. assess respondents' awareness and adoption of the recommended practices and
- iii. identify the constraints faced by the respondents in adopting the recommended practices in the study area.

The hypothesis of the study: There are no relationships between the socioeconomic characteristics of the respondents and adoption of the recommended practices.

METHODOLOGY

Adamawa State is located in North –eastern part of Nigeria. It lies between latitudes 7° and 11° N of the equator and longitudes 11° and 14° E of the Greenwich meridian (Adebayo and Tukur, 1999). It occupies a land area of about 42,159 square kilometres and has an altitude of about 185.9m above sea level. The study was conducted in ADP Zone III and IV, Adamawa State, Nigeria. Three Local Government Areas which were purposely selected were based on the concentration of commercial pumpkin farmers were involved in the study, Yola-North Local Government Area (ADP Zone III), Demsa and Numan Local Government Areas (ADP Zone IV). The study area lies between Latitude $9^{\circ}11'$ and $9^{\circ}46'$ North of the equator and between Longitudes $11^{\circ}00'$ and $12^{\circ}13'$ East of the Greenwich Meridian. The Local government has a total land area of about 2,843 km^2 with projected population of 411,227 people based on 2.9% yearly increment (NPC, 2017). The maximum temperature of the study area reaches 40°C , around April, while minimum temperature could be as low as 18.3°C between December and early January with a mean total rainfall of up to 919mm (Adebayo and Tukur, 1999). The major economic activities of the inhabitant include farming, civil service, trading, animal rearing and fishing. The vegetation of the study, availability and abundance of water (Rivers Benue and Gongola, and Lake Gerio) encourages irrigation farming (Adebayo and Tukur, 1999).

Primary data were used for this study. This was obtained by the use of questionnaire administered to the respondents. Data were obtained on socioeconomic characteristics of the respondents; adoption of the recommended practices and constraints faced by the respondents in the study area. Six cells (three from each zone) were purposively selected based on their involvement in commercial fluted pumpkin farming.

The cells are those along the Bank of river Benue and Lake Gerio where there is water available for irrigation. One hundred and ninety two (192) commercial fluted pumpkins farmers were selected for the study using snowballing sampling technique.

The analytical tools used for this study were descriptive and inferential statistics. Descriptive statistics involved frequency distribution, percentage and mean which were used to analyze socioeconomic characteristics of the respondents, adoption of recommended practices and problems faced by the respondents (objectives i, ii, and iv). Inferential statistics (multiple regression) was used to analyze relationship between the socioeconomic characteristics of the respondents and the level of adoption of recommended practices (objective iii).

The formula is given as:

$$Y=f(X_1, X_2, X_3, X_4, X_5, X_6, \mu)$$

Where;

Y= level of adoption of the recommended practices by the respondents (percentage of recommended practices used by a respondent)

X_1 = gender (dummy male 1, female 0)

X_2 = age (years)

X_3 = educational status (years of schooling)

X_4 = household size (number)

X_5 = farm size (in hectare)

X_6 = farming experience (in years)

X_7 = extension visit (number of visits/ year)

μ = error terms

RESULT AND DISCUSSIONS

Result on Table 1 reveals that most (85.4%) of the respondents were male. This result shows that fluted pumpkin production in the study area was male dominated. This could be as a result of the responsibility on male being household head, they have to cater for the household members. The result corroborates the finding of Nizamuddin, Mohammed and Anisur (2009) who reported that fluted pumpkin are remunerative crops and that farmers, particularly men, turn towards it production as is known to generate quick income for sustenance. The age distribution of the respondents shows that majority 57.3% of the farmers were below 40 years of age, while the mean age of the farmers was 35 years. This implied that respondents were in their prime, therefore energetic and could put in their best in their



agricultural activities. Nworu (2004) reported that younger farmers are more likely to take risk in adopting recommended fluted pumpkin production technologies than older farmers who are more often conservative.

Household size of the respondents shows that majority (66.6%) have household size of 6-10 persons, with the mean household size being 7 (Table 1). Large family size is important in the provision of family labour and accessing

information on improved production techniques from different sources. The distribution of the respondents according to educational level shows that majority (79.2%) of the respondents had formal education. One can therefore infer from this result that with the preponderance of educated farmers in fluted pumpkin production, adoption innovations and improved techniques may not be difficult because they are more likely to learn with ease and fast.

Table 1: Socioeconomic Characteristics of the Respondents

| Variable | Frequency | Percentage (%) | Mean |
|------------------------------|-----------|----------------|--------|
| Sex | | | |
| Male | 164 | 85.4 | |
| Female | 28 | 14.6 | |
| Age | | | |
| 20-29 | 42 | 21.9 | |
| 30-39 | 68 | 35.4 | 37 |
| 40-49 | 66 | 34.4 | |
| ≥50 | 16 | 8.3 | |
| Household size | | | |
| ≤5 | 26 | 13.5 | |
| 6-10 | 128 | 66.7 | 7 |
| >10 | 38 | 19.8 | |
| Education Level | | | |
| Non-formal | 42 | 21.9 | |
| Primary | 28 | 14.6 | |
| Secondary | 86 | 44.8 | |
| Tertiary | 16 | 8.3 | |
| Adult Education | 20 | 10.4 | |
| Farming Experience | | | |
| 1-5 | 112 | 58 | |
| 6-10 | 70 | 35.5 | 5.7 |
| ≥11 | 10 | 5.2 | |
| Farm Size | | | |
| ≤1 | 86 | 44.8 | |
| 1-1.5 | 74 | 38.5 | 1.6 |
| >1.5 | 32 | 16.7 | |
| Source of Information | | | |
| Friends and Neighbours | 154 | 80.2 | |
| Radio | 25 | 13.0 | |
| Extension Agents | 13 | 6.8 | |
| Income (N) per Season | | | |
| <20,000 | 19 | 9.9 | |
| 21,000-40,000 | 30 | 15.6 | |
| 41,000-60,000 | 68 | 35.4 | 48,000 |
| 61,000-80,000 | 56 | 29.2 | |
| >80,000 | 19 | 9.9 | |
| Extension Visit | | | |
| Yes | 14 | 7.3 | |
| No | 178 | 92.7 | |

Source: Field Survey, 2017

Majority (58.3%) of the respondents had farming experience between 1-5 years with a mean age of 5.7 years in farming fluted pumpkin. Experience brings specialization and increase in production and sustainability of fluted pumpkin

cultivation (Sunday, Ini-mfon, Samuel and Udoro, 2014). Result of the farm size of the respondents' shows that 44.8 % has farm size 1 hectares and below, while the mean farm size of the respondents was about 1.3 hectares. The finding

reveals that fluted pumpkin farmers in the study area were mainly small scale farmers; thus fluted pumpkin production is at subsistence level. Ogusi *et al.* (2014) classified small scale farmers as those having 0.1 - 1.59 hectares farm size. Table 1 also reveals that 80.2% of the respondents sourced their information on fluted pumpkin production from friends and neighbours, while 13.0% from Radio only 6.8% sourced their information from extension agents. This shows that there is inadequate extension coverage in the study area. About 35.4% of the respondents earned between N40, 000 to N60, 000 per season from fluted pumpkin production. This implies that pumpkin production is less profitable in the area, since this amount is hardly to cater for the needs of an average producer of the crop in a season. About 93% of the respondents had no extension visits. The result implies that there were inadequate extension services to the farmers. This may be due to low number of extension agents in the country. Chah, Abugu, Nwobode, Asadu and Igbokwe (2013) stated that, poor extension contact will often result in poor access to relevant information on how to improve agricultural production and this could be a discouraging factor for the farmers.

Awareness and adoption of recommended practices

Eleven recommended practices were made available to the farmers to identify their level of awareness and adoption. Result in Table 2 reveals that 99.0 % of the respondents indicated their awareness of selecting suitable site and land preparation for fluted pumpkin production with 93.2% adopting the practice. All the respondents (100%) were aware of the need for them to source their seed from accredited sources and 95.8% adopted such practice while 66.7% were aware of the need for seed treatment before planting but only 41.7 % adopted such a practice. Furthermore, 96.9% were aware of seed rate per hole to be

planted, while 87.5% adopted the practice. All (100%) of the respondents noted they were aware of the need for them to apply fertiliser, type and quantity of the fertiliser and they all (100%) adopted the practice. Fluted pumpkin needs irrigation especially during dry season (the time of irrigation and volume of water) all (100%) of the respondents were aware of this and adopted the practice. There is a need for staking of fluted pumpkin vine so as to encourage yield and to protect the crop from potential infections, 97.9% of the respondents were aware of this and 95.8% adopted the practice. Only 59.4% indicated they were aware on the importance and need for bio-control of pest, out of this figure 10.4 % adopted the practice. All (100%) the respondents were aware of the right time of pruning and harvesting of fluted pumpkin leaves so as to have fresh leaves and encourage sprouting and they all (100%) adopted the practice.

Result in Table 2 shows that, awareness and adoption among the respondents of suitable site selection and land preparation, sourcing seed from accredited sources, seed rate, type and recommended quantity of fertiliser application, regular irrigation and staking were high. However, seed treatment and Bio-control of pest were low compared to other practices. The reason adduced by farmers in the study area for low adoption rate of Bio-control of pest and seed treatment was that farmers consider the two operations as extra expenses and time wasting. The low awareness and adoption of Bio-control of pest agrees with the findings of Richard (2009) on adoption of pumpkin production technologies adoption in East and Central Kenya. But contradict the findings of Kamai (2016) in a study he conducted on adoption of improved Okra production technologies by farmers in Maiduguri area which showed that seed dressing with chemical was the most adopted technology.

Table 2: Awareness and adoption of recommended practices

| Variable | Awareness Yes | Adoption Yes |
|-------------------------------------|------------------|-----------------|
| Site selection and land preparation | 190 (99) | 179 (93.2) |
| Seed selection | 192 (100) | 184 (95.8) |
| Seed treatment | 128 (66.7) | 80 (41.7) |
| Seed density | 186 (96.9) | 168 (87.5) |
| Planting method | 184 (95.8) | 178 (92.7) |
| Time of Weeding | 192 (100) | 171 (89.1) |
| Fertiliser application | 190 (99) | 169 (88.0) |
| Irrigation (Time and Volume) | 192 (100) | 192 (100) |
| Staking | 188 (97.9) | 190 (99.0) |
| Bio-control of pest | 114 (59.4) | 20 (10.4) |
| Right time of Crop harvesting | 192 (100) | 192 (100) |

Source: Field Survey, 2017

Figures in Parenthesis indicates percentages



Relationship between socioeconomic characteristics and level of adoption

The result in Table 3 reveals that education (X_3), Household size (X_4), Farm size (X_5), Experience (X_6) and Income (X_7) were positive and significantly related to the adoption of recommended fluted pumpkin production practices. The result also reveals a coefficient of multiple determination (R^2) of 0.57. This is an indication that 57% of the variation in fluted pumpkin production practices adoption is explained by the explanatory variables of education, Household size, Farm size, Experience and Income.

Education (X_3) was positively related to the adoption of recommended practices at 5% of significant, which implied that as respondent's level of education increases so also his level of adoption. This is because, education improves awareness by enabling farmers to comprehend the technicalities involved in modern methods of production. This argument was supported by Opara (2010) who asserted that, farmers with higher education are better equipped for making more informed decision for lives and for their communities as well as becoming active participants in economic, social, and cultural dimension of development. Coefficients of Household size (X_4) and Experience (X_5) were positively and significantly related to the level of adoption of recommended production technologies

at 5% level. This means, the higher the number of members of household of a respondent, the more the tendency of them using recommended production technologies of fluted pumpkin. This may be because members of the household may have the opportunities of getting new ideas from different sources as a result of interacting with different people and have family labour to practice the technologies. The positive and significance relationship of years of experience implies that, as the farmers experience increases, so also their use of the technologies and the ability to make use of the technologies correctly. Experience implies more familiarity, specialization and perfection with the practice of modern methods of fluted pumpkin farming, which could encourage their adherence to these practices.

Farm size (X_6) was significant at 1% and income (X_7) at 5% to adoption of recommended practices. This shows that, the larger the farm owned by a farmer, the more the likelihood of the farmer using recommended practices of fluted pumpkin production. This could be because technologies brings easiness in carrying tasks, therefore, the larger a farm is, the more the tendency of the farmer adopting modern practices so as to ease his farm operations. Since a modern technology comes with financial implications, therefore, as the income of a farmer increases, his level of adoption will also increase.

Table 3: Socioeconomic Characteristics Influencing Adoption of Recommended Practices

| Variable | Coefficient | Std. Error | t- Statistics |
|---------------------------|-------------|------------|---------------|
| Gender (X_1) | -4.94505 | 0.001623 | -0.030 |
| Age (X_2) | 0.015254 | 0.041975 | 0.363 |
| Education (X_3) | 0.094559 | 0.041204 | 2.295** |
| Household size (X_4) | 0.015844 | 0.008333 | 1.901281** |
| Experience (X_5) | 0.043996 | 0.017834 | 2.467** |
| Farm size (X_6) | 0.020853 | 0.004037 | 5.165* |
| Income (X_7) | 0.110634 | 0.044222 | 2.502** |
| Extension visit (X_8) | 0.055813 | 0.049884 | 1.119 |
| Constant (C) | 2.960255 | 0.112388 | 26.340* |
| R^2 | 0.57 | | |
| Adjusted R^2 | 0.54 | | |
| F- Stat | 23.017 | | |

*, ** Significant at 1 and 5% respectively

Source: Field survey, 2017

Constraint faced by the respondents in fluted pumpkin production

Result of the constraints faced by respondents in the study area is presented in Table 4. It was revealed that 99.0% of respondents were constrained by inadequate extension services. Chah, Abugu, Nwobode, Asadu and Igbokwe (2013) stated that, poor extension contact will often result in poor access to relevant information on

how to improve agricultural production and this could be a discouraging factor for the farmers.

High cost of inputs (85.4%) was the second constrained faced by respondents and 85.9% by poor access to irrigation facilities. About 69% of the respondents reported poor road network as a constraints. The state Government banned the use of motor cycle in the major towns of the state, which is the major means of transportation along the river bank since there is no road for vehicles.

Estolas (1996) reported that farmers experience a number of constraints in agricultural production; these includes inadequate fund, inadequate training

and extension support, inadequate irrigation facilities, high cost of farm inputs and road conditions among others.

Table 15: Constraints faced by the respondents

| Constraints | *Frequency | Percentage | Rank |
|----------------------------------|------------|------------|-----------------|
| Inadequate of extension service | 190 | 99.0 | 1 st |
| High cost of inputs | 164 | 85.4 | 2 nd |
| Poor road network | 132 | 68.8 | 3 rd |
| Inadequate/ lack of funds | 126 | 65.6 | 4 th |
| Inadequate irrigation facilities | 78 | 40.6 | 5 th |

*Multiple responses exists

Source: Field Survey, 2017

CONCLUSION AND RECOMMENDATIONS

Based on the findings of the study, it was concluded that fluted pumpkin farming were mostly undertaken by male farmers that are in their active age and attended formal education. They cultivated an average farm size of 1.6 hectares with average household size of 7 people. The study also revealed that the socioeconomic variables (Education, Household size, Farm size, Experience and Income) of the respondents positively influenced the adoption of recommended practices. Generally, the awareness of the recommended practices by the respondents' was high, but little discrimination existed in the adoption behaviour of the farmers with partial adoption among the farmers with respect to some recommended practices.

In view of the findings of the study, the following recommendations are made:

- i. To increase fluted pumpkin production, government and other non-government agencies should provide micro-credit to farmers.
- ii. Farmers growing fluted pumpkin should form cooperative association which will help them to borrow from micro finance institutions.
- iii. Extension services should be strengthened so that they can be making frequent visits to farmers.
- iv. There is need for re-orientation of the existing innovations by the extension agents thereby making farmers to see the recommended practices as a package of solving problem which farmers should adopt all, not different units within a component from which to select and adopt only desired practices.

REFERENCES

Achinewhu, S. C. and Isichei, M. O. (1990). The nutritional evaluation of fermented fluted pumpkin (*Telfairiaoccidentalis* Hook F.) *Discovery and Innovation* 2: 62 – 65.

Adebayo, A. A. and Tukur, A. L. (1999). Adamawa State in Map, Publish by Department of Geography, Federal University of

Technology Yola, Adamawa State, Nigeria Pp. 1-35.

Akoroda, M. O. (1990). Ethnobotany of *Telfairiaoccidentalis* (*Cucurbitaceae*) among Igbos of Nigeria. *Economic Botany*. 44(1): 29-39.

Ali, K. (1996). "Positioning of fast-food outlets in two Region of North America: comparative study using correspondence Analysis," with Kaynak, E. And Kechkemiroglu, O. *Journal of professional service marketing*. 14(2): 99-119.

Badifu, G. I. O. and Ogunsina, A. O. (1991). Chemical composition of kernels from some Species of cucurbitaceous growth in Nigeria. *Plant Food Human Nutrition*.41: 35-44.

Chah, J. M., Abugu, R. O., Nwobode, C., Asadu, A. N. and Igbokwe, E. M. (2013). Agricultural extension needs of farmers in telfairia production and marketing in Enugu State, Nigeria. *Journal of agricultural Extension*. 17(1): 49-60.

Egbekan, M. K., Nda-Sulaiman, E. O. and Akinteye, O. (1998). Utilisation of Fluted Pumpkin Fruit (*Telfairia Occidentelis*) in Marmalade Manufacturing. *Plant Foods for Human Nutrition*.52(2): 171-176.

Eleke, S. E. C. (2004). Vegetable for cash. *Saturday Daily Independent Newspapers*. October 30, pp. 88.

Essien, A. L., Ebang, R. and Udo, H. B. (1992). Chemical evaluation of pod and pulp of the fluted pumpkin (*Telfairiaoccidentalis*) fruit. *Food chemical*. 45: 175-178.

Estolas, W. R. (1996). Extent of utilisation of farming technologies recommended by Benguet State University. MS Thesis. Benguet State University, La Trinidad, Benguet.

Fasuyi, A. O. (2006). Nutritional potentials of some tropical vegetable leaf meals: Chemical characterization and functional properties.



- African Journal of Biotechnology*, 5: 49-53.
- Food and Agriculture Organisation (FAO), (2002). Report of the second consultation on agricultural information management. Rome, Italy. Available on <http://www.fao.org/docrep/>
- Francisca, S. I. and Eyzayuirre, P. (2006). African leafy vegetables: Their role in the World Health Organisation's Global Fruit and Vegetable Initiative.
- Kamai, M. (2016). Study on Adoption of Improved Okra Production Technologies by Farmers in Maiduguri Area, Borno State, Nigeria. *Agro-satellite Journal*, 15(2):6-12
- Nizamuddin, K., Mohammed, S., and Anisur, R. (2009). Vegetable revolution and rural sustainable development; a case study. *Journal for Geography*. 4(1): 177- 188.
- Nworu, J. C. (2004). "Rural Credit Markets and arable crop production in Imo State of Nigeria", Ph. D. Dissertation, Department of Agricultural Economics, Michael Okpara University of Agriculture, Umudike, Nigeria
- Richard, N. (2009). Socioeconomic Factors Influencing Smallholder Pumpkin Production, Consumption and Marketing in Eastern and Central Kenya Regions. Un-published MSc. thesis, School of Agriculture and Enterprise Development, Kenyatta University.
- Sunday, B. A., Ini-mfon, V. P., Samual, J. U. and Udoro, J. U. (2014). Choice of soil management technique as adaptation to climate change among fluted pumpkin farmers in Akwa-Ibom State, Nigeria. *African Journal of Agricultural Economics and Rural Development*. 2(2):112-120.
- Udoh, E. J., and Akpan, S. B. (2011) Measuring technical efficiency of water leaf (*Talinum triangulare*) production in Akwa-Ibom State, Nigeria. *American-Eurasian Journal of Agriculture and Environmental Science*, 2(5), 518-522.
- Ogusi, O. D., Begho, T., and Ewolor, S. A. (2014). Resource use efficiency and profitability of fluted pumpkin production in Ukwani Local Government Area of Delta State Nigeria. *American Journal of Agriculture and Forestry*. 2(4): 129-134
- Opajobi, A. O., Esume, C. O., Osasuyi, A. and Okehie, C. C. (2011). Determination of the lead content of Pumpkin leaf *Telfairia Occidentalist* in selected towns of Delta State, Nigeria. *Journal of current world Environment*. 6(1): 39-44.
- Ugwu, F. J. (2001). Studies on the aetiology of the wilt disease of fluted pumpkin in Nsukka Local Government Area of Enugu State. M.Sc. thesis submitted to Department of Botany, University of Nigeria, Nsukka.
- Umeha, C. (2002). The imperatives of nutrition for pregnant mothers and growing children. *The Guardian Newspapers* p. 30