Nigerian Agricultural Policy Research Journal (NAPReJ) Agricultural Policy Research Network (APRNet)
Vol. 10, Special Issue. Website:http:// www.aprnetworkng.org ©2022

ISSN 2536-6084 (Print) & ISSN 2545-5745 (Online)

Indigenous and Improved Yam Storage Technologies in Delta and Edo States, Nigeria: Comparative Compatibility Approaches

[1]Agoda S., [2*]Ovharhe, O.J, [1]Aderele S. A., [1]Adeoti J. T., [1]Adeoti V. E. and [1]Olaitan R.
[1]Department of Research Outreach, Nigerian Stored Products Research Institute (NSPRI),
13 Lawrence Road, P.M.B. 4065, Sapele, Delta State, Nigeria.
[2]Department of Agricultural Extension, Dennis Osadebay University, Asaba, Delta State, Nigeria

*Corresponding author: drovharhe.oghenero@gmail.com; ovharhe.oghenero@dou.edu.ng

A R T I C L E I NFO

Keywords:

Indigenous,

improved,

yam farmers,

compatibility,

technologies,

storage structures

ABSTRACT

This study examined Farmers comparison of compatibility of indigenous and improved yam storage technologies in Delta and Edo states of Nigeria. A sample size of four hundred and forty-nine thousand (449) yam farmers were interviewed. Data for the study were collected through interview schedule using structured questionnaire. Data collected were subjected to analysis using statistical packages for social sciences (SPSS). Results of data analysis show that majority (79.1%) of the yam farmers were males while 20.9% were females and the mean age of the yam farmers was 47 years. Majority (30.7%) of the farmers' possessed junior secondary school certificate with a average farming experience of 13 years. The mean responses from the respondents reviewed that indigenous and improved yam storage technologies are technically, economically, socio-culturally and environmentally compatible in the study area. It is therefore recommended that Indigenous and improved yam storage technologies be used simultaneously by yam farmers since they are technically, economically, socio-culturally and environmentally compatible. There is need to develop and construct packages of improved yam storage technologies and be given to yam farmers at a subsidies rate. High publicity to improved yam storage technologies for adoption by farmers is a necessity.

Introduction

Nigeria is one of the world's leading yam producers. It accounts for 70–76 percent of global production. Yams are grown in rain forests, timber savanna, and southern savanna ecosystems along the coast. Anambra, Benue, Cross River, Adamawa, Delta, Ekiti, Imo, Edo, Kaduna, Ogun, Kwara, Ondo, Osun, Plateau, and Oyo are the states where yam is primarily grown in Nigeria. Yam is a root and tuber that is a staple meal in Nigerian and West African diets, providing about 200 calories of energy per capita on a daily basis. However, the current level of yam production in Nigeria is insufficient to accommodate the expanding population (Luka and Yahaya, 2012).

Indigenous knowledge is a distinct body of information established over time and linked with people in a certain geographic area in order for them to benefit from their natural resources. It is an indigenous society's storehouse of experience and knowledge about their technology, traditions, and beliefs that frequently serves as the foundation for making decisions that lead to stable livelihoods (Luka and Yahaya, 2012). Many cultures use indigenous knowledge to inform their decision-making in areas such as food security, human and animal health, education, natural resource management, and other critical economic and social activities (Gorjestani, 2002; Maretzki, 2013).

Tavana, (2002) mentioned that indigenous knowledge is divided into two categories: explicit indigenous knowledge and implicit indigenous knowledge. Explicit indigenous knowledge, according to Wyatt and Smith (2001), consists of facts, rules, relationships, and regulations that may be faithfully transcribed in paper or electronic form and communicated without discussion. They went on to define explicit indigenous knowledge as academic knowledge that is described in formal language, print or electronic media, and is utilized by people to document techniques.

Maretzki (2013) argued that tacit indigenous knowledge, like riding a bicycle, is difficult to communicate openly with words because it entails doing something without having to think about it.

In essence, tacit indigenous knowledge refers to customary wisdom that is difficult to describe or express to outsiders (Tavana, 2002). He went on to say that it was heavily influenced by a person's emotions, experiences, insights, observations, and perceptions. This study's indigenous knowledge will concentrate on yam growers' explicit indigenous knowledge practices.

Indigenous technologies, according to Gemet (2019), are the result of indigenous knowledge. Indigenous technology, he continued, refers to the technologies used by natives or a certain socio-cultural group inside a country to produce goods and services. Indigenous technology aims to improve people's ability to preserve and renew balance and harmony in a complex environment. According to Ovwigho and Chuks-Okonta (2001), indigenous technology serves as a foundation for enhanced technology. They argued that a people's cultural history influences the emergence of both indigenous and enhanced technologies.

Scientific knowledge refers to facts and concepts that have been discovered via a long process of inquiry and investigation. Improved technologies are the result of scientific research. It is knowledge gained via careful study and organized according to certain broad principles. Researchers in research centers and universities generate scientific knowledge, which is then transmitted to farmers through extension workers (Chema *et al*., 2003; Mehta *et al.*, 2013).

Harvesting techniques, handling, processing, storage structures, transportation, management decisions, infrastructure, consumer preferences/attitudes, and availability of financial markets are all factors that contribute to food loss, according to Aulakh and Regmi (2013). The losses suffered at each step in the food supply chain vary based on the organization and technologies utilized. For example, in less developed countries with less mechanized supply chains, losses during drying, storage, processing, and transportation are higher (Adejo, 2017).

According to Elemo (2017), Nigeria's yearly post-harvest losses have climbed to above $9 billion. She claims that post-harvest losses from perishable crops such as fruits, vegetables, and yam account for up to 50% of annual food crop production in Nigeria. She went on to say that poor transportation, storage, and handling facilities were important contributors to the losses. She stated that perishable crops with high moisture content, such as grains, roots, and tubers, are more prone to losses due to climatic and biological variables.

Respiration, sprouting, rot-causing organisms, rats, and moisture loss were the main causes of yam storage losses. Dormancy is interrupted after a period of storage, according to Eze, Eze, Ameh, and Dansi (2013), and sprouts appear primarily from the head area. According to Tschannen *et al.* (2003), sprout growth raises the tuber's respiration rate, resulting in significant dehydration and dry matter loss.

The quantity of storage loss is frequently determined by the type of storage technology used. According to Odeyemi and Daramola. (2000) and Eze *et al*. (2013), roughly 50-60% of food crops in Nigeria are preserved in traditional indigenous structures, particularly at the family and farm level, for consumption and seed planting. They stressed that native structures are composed of locally available materials such as grasses, woods, and mud, with no enhanced design to ensure long-term pest protection for crops.

In spite of the increasing yam storage technologies, losses due to storage have remained a major challenge to yam farmers. There is need to compare various technological approaches. This study is therefore designed to investigate farmers' comparison of the compatibility of indigenous and improved yam storage technologies by yam farmers in different States of Nigeria.

Objective of the Study

The general objective of the study was to examine farmers' compatibility comparison of indigenous and improved yam storage technologies in Delta and Edo States. The specific objective was to compare the technical, economic, socio-cultural and environmental compatibility of indigenous and improved yam storage technologies in Delta and Edo States;

Materials and Methods

Brief Description of the Study Area

The study area consists of Delta and Edo states. The two states were created out of the former Bendel state on August 27th, 1991. The geography of the two states are described in the following sub sections.

Delta State

Delta state has an estimated land area of 17,698 square kilometers and lies between Latitude 5^0 00^l and 6^0 30^l North of the equator and Longitude 5^0 00^l and 6^0 45^l East of the Greenwich Meridian. Edo State borders it on the north, Balyesa and Anambra on the south, and Ondo State on the west. With a shoreline of 160 kilometers, the Atlantic Ocean defines its southern border (MANR, 2002). The State has a population of Four million, one hundred and twelve thousand, four hundred and forty five (4,112,445) people. There are two million sixty-nine thousand thirty-nine (2,069,309) males and two million forty-three thousand one hundred and thirty-six (2,043,136) girls in this group (NPC, 2006). Delta State is made up of twenty-five (25) Local Government Areas. The state is sub-divided into three senatorial districts, namely; Delta North (Ukwuani, Ndokwa-West, Ndokwa-East, Aniocha-South, Aniocha-North, Ika North-East, Ika South and Oshimili South, and Oshimili North), Delta Central (Ughelli South, Ughelli North, Ethiope East, Ethiope West, Sapele, Uvwie, Udu and Okpe); and Delta South (Bomadi, Burutu, Isoko-South, Isoko-North, Warri-North, Warri-South, Warri South-West and Patani).

Delta State Agricultural and Rural Development Authority (DARDA) divided the state into three (3) agricultural zones namely Delta North, Delta Central and Delta South Agricultural zones. The major occupations of people are farming, hunting, fishing and poultry.

Edo State

Edo state has an estimated land space of 17,802 square kilometers and lies between latitude 6^0 30^l North and Longitude $6^0 00^l$ East of the Greenwich meridian. The State is confined on the north and east by Kogi State, on the south by Delta State and on the west by Ondo State. Edo State has inhabitants of about Three million, two hundred and thirty three thousand, three hundred and sixty six (3,233,366) people. This is made up of One million, six hundred and thirty three thousand, nine hundred and forty six (1,633,946) males and One million, five hundred and ninety nine thousand, four hundred and twenty (1,599,420) females (NPC, 2006). Edo State is made up of eighteen (18) Local Government Areas. It is divided into three (3) Agricultural zones namely; Edo South (Oredo, Egor, Ikpoba-Okha, Orhionmwon, Ovia North-East, Ovia South-West, and Uhunmwode); Edo Central (Esan Central, Esan North-East, Esan West, Esan South-East and Igueben), and Edo North (Akoko-Edo, Estako Central, Estako East, Estako West, Owan East and Owan West).

Crude oil, limestone, marbles, quartzite, gold, chalk, and clay are among the numerous mineral resources found in the state. The inhabitants of Edo State's primary indigenous occupation is farming.

Sampling Techniques and Sample Size

Simple random sampling techniques done on a multi-stage basis was used to select extension blocks, cells and respondents. The first stage involved random selection of 60% of extension blocks from each of the three (3) agricultural zones in Delta and Edo States. This gave a total of fifteen (15) extension blocks in Delta and eleven (11) extension blocks in Edo State. The second stage involved random selection of 40% of extension cells from the selected extension block. This gave a total forty-five (45) extension cells in Delta and in Edo state this will give a total of thirty-six (36) extension cells. The third stage involved random selection of 20% of yam farmers from each cell in the three agricultural zones in Delta and Edo states. In Delta state this gave a total of two hundred and nineteen (219) yam farmers and in Edo state it give a total of two hundred and forty six (246) yam farmers. The sample size therefore was hundred and sixty five 465 yam farmers. Out of which 449 respondents information were useful. The sample size distribution is shown in Table 1.

Table 1: Numbers of questionnaires issued and retrieved from yam farmers in Delta and Edo States

State/Zone	No of questionnaire Issued	No of questionnaire retrieved	No of questionnaire not retrieved	percentage retrieved
Delta				
Delta North	77	73	4	94.81
Delta Central	103	97	6	94.17
Delta South	39	38	1	97.43
Sub-total	219	208	11	
Edo				
Edo North	93	93	0	100
Edo Central	63	61	2	96.83
Edo South	90	87	3	96.67
Sub-total	246	241	5	
Grand total	465	**449**	16	

Percentage of Questionnaires Retrieved $\left(\frac{449}{465} X \frac{100}{1}\right) = 96.56\%$

Data for the study were collected through interview schedule using structured questionnaire. Data collected were subjected to analysis using statistical packages for social sciences (SPSS)

Result and Discussion

This section presented the data and discussion of findings of the study in the following ways; demographic characteristics of the yam farmers and farmers perception of compatibility of indigenous and improved yam storage technologies.

Demographic Characteristics of the yam Farmers.

The demographic data were gender, age, marital status, educational level, household size, farming experience and religion (Table 2)

Gender

Majority of the respondents in the study areas were male dominated (79.1%) while 20.9% were females. This findings agreed with David (2015) which stated that yam production in Nigeria is male dominated. Olayemi et al. (2012), in their study on Planting date and gender of yam farmers and the adoption of yam minisett technique in Nigeria, observed that yam production was dominated by men.

ISSN 2536-6084 (Print) & ISSN 2545-5745 (Online)

Age

The mean age of the respondents is 47 years. Age as a factor is very important in farming. The age of a farmer can generate or erode confidence in adoption of improved storage techniques. Caswel *et al.* (2001) explained that elderly farmers often have different goals other than income maximization in which case, they would be expected to adopt an income-enhancing technology

Marital Status

A high proportion of the respondents were married (77.5%), single (10.9%), divorced (2.9%) widow (1.6%), Widower (2.0%), separated (1.3%) and respondents who do not indicate their marital status (3.8%). The high proportion of the married respondents implies that most of them have family responsibility that need financial commitment (Ayado, 2017).

Educational Level

Majority of the respondent have Junior Secondary School (JSS) education (30.7%), Senior Secondary School (24.7%), Ordinary National Diploma / National Certificate in Education (16.7%), Non-formal Education (10.2%), respondents who do not indicate their educational level (8.7%), primary school leaving certificate (6.9%) Higher National Diploma/Bachelor of Science Degrees (1.8%) and Post-graduate degrees (0.2%). Education is thought to create a favourable mental attitude for the acceptance of new practices (Caswell et al 2001). Doss and Morris (2001) explained that increased education was expected to improve the productivity of farmers.

Household size

The mean household size is 6. A large household size will be able to provide the labour that might be required for the adoption of improved yam storage technology. This is similar to the findings of Ovharhe, et al. (2021) that the average household sizes of farmers in Delta ranges between 4 and 6.

Farming experience

The mean farming experience of the respondents was 13 years. This implies that yam farmers in the study areas were experienced. Higher relative experience will be positively associated with adoption of improved yam storage technologies.

Religion

Majority of the respondents were Christian (73%), muslim (17.6%), traditional (7.6%), and religion not indicated (1.8%)

Table 2: Demographic characteristics of the yam farmers

S/N	Characteristics	Frequency N=449	Percentage	Mean	Mode	Remark
1.	Gender:					
	Males	79.1			Male	Male
	Female	20.9				dominated
2.	Age			47	50	Middle age
3.	Marital Status					
	Married	348	77.5			Married
	Single	49	10.9			
	Divorced	13	2.9			
	Widow	7	1.6			
	Widower	9	2.0			
	Separated	6	1.3			
	Marital status not indicated	17	3.8			
4.	Educational level ;					
	No Formal Education	46	10.2			
	Primary School Leaving	31	6.9			
	Certificate	138	30.7		JSS	
	Junior Secondary School	111	24.7			
	Certificate	75	16.7			
	Senior Secondary School	8	1.8			
	Certificate	1	0.2			
	OND/NCE	39	8.7			
	HND/B.SC					
	Post- graduate					
	Educational level not indicated					
5.	Households size:			6.4	6	
6.	Farming Experience			13years	6	
7.	Religion:					
	Christian	327	73.0		Christian	
	Muslim	79	17.6			
	Traditional	34	7.6			
	Free thinker	4	0.9			
	Religion not indicated	4	0.9			

Source: **Field data**

ISSN 2536-6084 (Print) & ISSN 2545-5745 (Online)

In Table 3 respondents agreed that indigenous yam storage technologies are easy to operate by farmers with mean score (3.708), indigenous yam storage technologies are made of locally available material with mean score (3.637) and indigenous yam storage technologies are easy to construct with mean score (3.316). These indicated that indigenous yam storage technologies are technically compatible.

Table 3: Mean response to farmers perception of technical compatibility of indigenous yam storage technologies (N=449)

S/N	Statements	Mean	Std. Error	Remark
i.	Indigenous yam storage technologies are easy to operate by farmers.	3.708	.028	Economically Compatible
ii.	Indigenous yam storage technologies are easy to construct.	3.316	.033	Economically Compatible
iii	Indigenous yam storage technologies are made of locally available materials.	3.637	.027	Economically Compatible

Source: Field data *NB:* Mean cut off = 2.50

In Table 4 respondents agreed that indigenous yam storage technology are easy to procure with mean score (3.361), indigenous yam storage technologies are cheap with mean score (3.345), indigenous yam storage technologies minimize risk of investment with mean score (3.123), indigenous yam storage technologies minimize losses with mean score (2.902) and indigenous yam storage technologies are durable with mean score (2.704). These indicated that indigenous yam storage technologies are economic compatible.

Table 4: Mean response to farmers perception of Economic Compatibility of indigenous yam storage Technologies (N=449)

Statements		Mean	Std. Error	Remark
i.	Indigenous yam storage technologies minimize risk of investment.	3.123	.038	Economically Compatible
ii.	Indigenous yam storage technologies are cheap	3.345	.030	Economically Compatible
iii.	Indigenous yam storage technologies are easy to procure.	3.361	.037	Economically Compatible
iv.	Indigenous yam storage technologies minimize losses	2.902	.038	Economically Compatible
v.	Indigenous yam storage technologies are durable	2.704	.051	Economically Compatible

Source: Field data, 2020
NB: Mean cut off = 2.50

In Table 5 respondents agreed that indigenous yam storage technologies are not affected by religious belief with mean score (3.521), indigenous yam storage technologies do not require much formal education and experiences with mean score (3.403), indigenous yam storage technologies are culturally acceptable with mean score (3.227), indigenous yam storage technologies are not well spread among farmers social group with mean score (2.913) and indigenous yam storage technologies promote community participation with mean score (2.659). These indicated that indigenous yam storage technologies are socio-culturally compatible.

Table 5: Mean response to farmers perception of socio-cultural compatibility of indigenous yam storage technologies (N=449).

S/N	Statements	Mean	Std. Error	Remark
i.	Indigenous yam storage technologies are culturally acceptable.	3.227	.041	socio-culturally Compatible
ii.	Indigenous yam storage technologies do not require much formal education and experiences.	3.403	.029	socio-culturally Compatible
iii	Indigenous yam storage technologies promote community participation.	2.659	.043	socio-culturally Compatible
iv	Indigenous yam storage technologies are not well spread among farmers social group	2.913	.042	socio-culturally Compatible
v.	Indigenous yam storage technologies are not affected by religious belief	3.521	.089	socio-culturally Compatible

Source: Field data *NB:* Mean cut off = 2.50

In Table 6, respondents agreed that indigenous yam storage technologies do not pollute the environment with mean score (3.183) and yam stored under indigenous storage technologies are not easily affected by weather elements with mean score (2.786). These indicated that indigenous yam storage technologies are environmentally compatible.

Table 6: Mean response to farmers perception of environmental compatibility of indigenous yam storage technologies (N=449)

S/N	Statements	Mean	Std. Error	Remark
i.	Indigenous yam storage technologies do not pollute the environment.	3.183	.034	Environmentally compatible
ii.	Yam stored under indigenous storage technologies are not easily affected by weather elements.	2.786	.045	Environmentally compatible

Source: Field data, 2020
NB: Mean cut off = 2.50

In Table 7, respondents agreed that improved yam storage technologies made of locally available materials with mean score (2.806), improved yam storage technologies are easy to operate by farmers with mean score (2.517), and improved yam storage technologies are with mean score (2.443). These indicated that improved yam storage technologies are technically compatible.

Table 7: Mean response to farmers perception of technical compatibility of improved yam storage technologies (N=449)

S/N	Statements	Mean	Std. Error	Remark
i.	Improved yam storage technologies are easy to operate by farmers.	2.517	.038	Technically compatibility
ii.	Improved yam storage technologies are easy to construct.	2.443	.047	Not-technically compatibility
iii	Improved yam storage technologies made of locally available materials.	2.806	.041	Technically compatibility

Source: Field data *NB:* Mean cut off = 2.50

In Table 8, respondents agreed that improved yam storage technologies are durable with mean score (3.262), improved yam storage technologies minimize losses with mean score (3.178), improved yam storage technologies are easy to procure with mean score (2.895), improved yam storage technologies minimize risk of investment with mean score (2.806) and improved yam storage technologies are cheap with mean score (2.501). These indicated that improved yam storage technologies are economically compatible.

Table 8: mean response to farmers perception of economic compatibility of improved yam storage technologies (N=449)

S/N	Statements	Mean	Std. Error	Remark
i.	Improved yam storage technologies minimize risk of investment.	2.806	.044	Economically compatible
ii.	improved yam storage technologies are cheap.	2.501	.046	Economically compatible
iii.	Improved yam storage technologies are easy to procure.	2.895	.041	Economically compatible
iv.	Improved yam storage technologies minimize losses	3.178	.035	Economically compatible
v.	Improved yam storage technologies are durable	3.262	.036	Economically compatible

Source: Field data *NB:* Mean cut off = 2.50

In Table 9, respondents agreed that improved yam storage technologies are not affected by religious belief with mean score (3.258), improved yam storage technologies are well spread among farmers with mean score (3.205), improved yam storage technologies promote community participation with mean score (2.853), improved yam storage technologies do not require much formal education and experiences with mean score (2.715) and improved yam storage technologies are culturally acceptable with mean score (2.586). These indicated that improved yam storage technologies are socio-culturally compatible.

Table 9: Mean response to farmers perception of socio-cultural compatibility of improved yam storage technologies (N=449)

S/N	Statements	Mean	Std. Error	Remark
i.	Improved yam storage technologies are culturally acceptable.	2.586	.042	socio-culturally compatible
ii.	improved yam storage technologies do not require much formal education and experiences.	2.715	.041	socio-culturally compatible
iii.	Improved yam storage technologies promote community participation.	2.853	.045	Socio-culturally compatible
iv.	Improved yam storage technologies are well spread among farmers.	3.205	.035	Socio-culturally compatible
v.	Improved yam storage technologies are not affected by religious belief.	3.258	.033	Socio-culturally compatible

Source: Field data *NB:* Mean cut off = 2.50

In Table 10, respondents agreed that improved yam storage technologies do not pollute the environment with mean score (3.056) and yam stored under improved storage technologies are not easily affected by weather elements with mean score (2.946). These indicated that improved yam storage technologies are environmentally compatible.

Table 10: Mean response to farmers on environmental compatibility of improved yam storage technologies (N=449)

S/N	Statements	Mean	Std. Error	Remark
i.	Improved yam storage technologies do not pollute the environment.	3.056	.033	Environmentally compatibility
ii	Yam stored under improved storage technologies are not easily affected by weather elements.	2.946	.035	Environmentally compatibility

Source: Field data *NB:* Mean cut off = 2.50

Conclusion and Recommendations

The study reviewed the various indigenous and improved yam storage technologies adopted by yam farmers in the study areas. The indigenous and improved yam storage technologies were technically, economically, socio-culturally and environmentally compatible in the study areas. Therefore Indigenous and improved yam storage technologies should be used simultaneously by yam farmers since they are technically, economically, socio-culturally and environmentally compatible.

Acknowledgements

We hereby acknowledged the management of Nigerian Stored Products Research Institute (NSPRI), Edo state Agricultural Development Programme (EADP), Delta state Agricultural Rural Development Authority (DARDA) and yam farmers for making available all the data that were used for this study.

REFERENCES

Adejo, P.E (2017). Post-Harvest Management Practices of Yam and Farmers' Information Needs in the North-Central of Nigeria. *Journal of Nutraceuticals and Food Science*, 2 (3):1 - 9

Aulakh, J., Regmi, A., Fulton, J. and Alexander, C. (2013). Estimating *Post-Harvest Food Losses: Developing a Consistent Global Estimation Framework*. In: Selected Paper Prepared for Presentation at the Agricultural & Applied Economics Association's 2013 AAEA & CAES Joint Annual Meeting, Washington DC. August 4th-6th, 2013

Ayado S (2017). Discordant tunes over yam export policy in Nigeria. Article published in the Leadership Newspaper 19th June 2017.

Caswel, M., Fugile, K., Ingram, C., Jans, S., and Kasca, K. (2001). Adoption of Agricultural Production practices Lessons Learned from the Area Study Project. Washington Reseach Service. Agricuture Economic Report No. 792.

Chema, S, Gilbert, E and Roseboom, J, (2003). *A review of key Issues and Experiences in Reforming Agricultural Research in Kenya*. The Hague: ISNAR.

David,S. (2015). "Getting a piece of the pie: An Analysis of Factors Influencing Women's Production of Sweet potato in Northern Nigeria. 1 (1): 1- 6.

Doss,C.R, and Morris, M.L. (2001) How does the gender affect the adoption of agricultural

Innovation? The case of improved maize technologies in Ghana. *Journal of agricultural economics 25:27-39*

Elemo, G. (2017) *A keynote address at a two-day Workshop of GAIN-PLAN Nigeria Cold Chain Summit, Ikeja. Lagos.*

Eze, S. C.1, Eze, E. I.1, Ameh, G. I.2 and Dansi, A. (2013). Effect of some botanical extracts on post-harvest losses of yam (*Dioscorea rotundata*) in improved yam barn in Nigeria. *African Journal of Biotechnology*, 12(16): 1962-1967,

Gemet (2019) “Concept version” Eionet Environmental and Observation Network. 4.1.3.

Gorjestani, N. (2002), *Indigenous Knowledge for Development, Opportunities and Challenges, United Nations Conference on Trade and Development, Geneva*.

Luka E. G, Yahaya H (2012). *Perceived constraints to use of indigenous soil management practices among yam producers in Nasarawa state, Nigeria*. J. Sust. Dev. Afr., 14(2):1520 – 5509.

Maretzki, A, Alter, T.R, Semali, L.M, and Mehta, K. (2013), Acadmik Connections: Bringing Indigenous knowledge and perspectives into the classroom, *Journal of Community Engagement and Scholarship*, 6(2) 83 – 91.

Mehta, K, Alter, T.R, Semali, L.M, and Maretzki, A. (2013), Acadmik Connections: Bringing Indigenous knowledge and perspectives into the classroom, *Journal of Community Engagement and Scholarship*, 6(2) 83 – 91.

Odeyemi, O.O. and Daramola, A.M. (2000) *Storage Practices in the Tropics Volume 1: Food Storage and Problems*: Akure, Dave Collins Publications.

Olayemi, F.F, Adegbola, J.A, Bamishaiye, E.I and Awagu E.F, (2012). Assessment of postharvest Losses of some Selected Crops in Eight Local Government Areas of Rivers State, Nigeria. *Asian Journal of Rural Development* 2(1): 13-23.

Ovwigho, B.O and Chuks-okonta, V.A.A. (2001). Comparative Analysis of indigenous and Modern Aquaculture in Ughelli South Local Government Area of Delta State, In: Olowu T.A (ed). *Proceedings of the Seventh Annual National Conference of the Agricultural Extension Society of Nigeria*, 19th -22nd August.

Ovharhe, O. J., Emaziye, P. O., Okpara, O., Agoda, S. and Benson, C. O. (2021). Strategies adopted by maize farmers to minimize post-harvest losses in Delta State, Nigeria. *International Journal of Agricultural Technology 17*(1):237-256.

Tavana, N. (2002), *Traditional Knowledge is the key to sustainable development in Samoa*: Examples of Ecological Botanical and Taxonomical knowledge, in processing of the national 2001 National Environment Form. No. 3. PP 19 – 26. Apia Samoa: Ministry of Natural Resources and Environment.

Tschannen, A. T., Girardin, O., Nindjin, C., Dao, D., Farah, Z., Stamp, P. and Escher, F.(2003). Improving the application of gibberellic acid to prolong dormancy of yam tubers (Dioscoreaspp.). *Journal of the Science of Food and Agriculture* **83**:787-796.