International Journal of Innovative Agriculture & Biology Research 5(4):30-37, Oct.-Dec., 2017

© SEAHI PUBLICATIONS, 2017 www.seahipaj.org ISSN:2354-2934

Analysis of Socio – economic Challenges of Using Local Storage Systems for Root and Tuber Crops in Benue State, Nigeria

Tor, I.E*[1]; Iheanacho, A.C[1]; Okeke, A.M[1]

[1]Department of Agribusiness,
University of Agriculture, Makurdi, Nigeria.

ABSTRACT

This study examined the socio – economic challenges of local storage systems for root and tuber crops in Benue State, Nigeria. Specifically, it describes the socio – economic characteristics of root and tuber crops farmers in the State; identifies the local storage systems for root and tuber crops and examine the challenges associated with each of the storage systems in the State. A sample of 288 root and tuber crops farmers engaged in cassava, yam, and sweet potato production was selected using multi-stage sampling technique, and data were collected using questionnaire. Data collected were analyzed using descriptive statistics and factor analysis. Majority of the respondents were males (77.3%) and most of them were married (80.1%).The mean household size and mean age were found to be eight (8) and 40 respectively, while years of formal education and farm size had mean of 13 years and 6.3 Ha respectively. The mean annual income was estimated as ₦1, 371,815.03 per year while the mean output was found to be 62032.41kg per year. Majority of the respondents (64.64%) make use of barns for yam storage since yams are the major crop farmed in the study area. 38% make use of protective roof and 22.86% make use of delayed harvesting to preserve their cassava. The study identified limited land, high cost of labour, labour unavailability, low soil fertility, lack of extension contact, poor knowledge of root and tuber technologies, poor management skills, poor storage facilities, lack of credit, high cost of planting material, rot and decay during storage, and pest and disease as the constraining variables to the local storage systems in the study area. It recommended that information from research institutes on the utilization of improved local storage techniques should be made available to extension agents so that they can pass it across to root and tuber crops famers for adoption. Consequently, government should employ more extension workers and they should be made to visit farmers from time to time. Credit should be made available to farmers via root and tuber crops producers association without the burden of collateral.

Key words: Challenges, Local Storage Systems, Root and Tuber Crops, Benue State, Nigeria.

INTRODUCTION

Root and tuber crops which include cassava (*Manihot esculenta* Crantz), yam (*Dioscorea* spp), sweet potato (*Ipomea batatas* L.), potato (*Solanum* spp), and edible aroids (*Colocasia* spp, and *Xanthosoma sagittifolium*), play significant roles in the socio-economic lives of people of sub-Saharan Africa. Reports by African Ministerial Council on Science and Technology (AMCOST) (2006) and Food and Agricultural organization (FAO) (1998) revealed that these crops are important in household food security and income generation in many African countries. About 500 to 700 million people across the humid, tropical world which includes less-developed countries (LDCs), grow and consume these crops as their staple food (Ravi *et.al*.1996).

They identified the traditional storage methods for cassava as underground storage, box storage, and bag storage, with addition of storage house structure and "mound" storage structure for sweet potatoes. Yam local storage methods include yam barn, underground and storage house structures.

Despite the wide spread and continued use of traditional storage practices by root and tuber crop farmers in Benue State and the benefits of these crops, post-harvest losses have continued to dampen their potentiality. Post-harvest losses in root and tuber crops have been attributed to the local methods for

storing these crops. According to Tyler (1982), Mughogho (1989); Omoruyi and Orhue (1991), produce stored under the traditional system usually do not keep long and farmers usually suffer great losses. This report is corroborated by Okoedo-Okojie and Onemolease (2009) who reported that indigenous storage of farm produce is less effective compared to modern storage methods.

Though improved methods of storage of root and tuber crops are available, with attempt to minimize crop losses and reduce the causes of post-harvest deterioration, there has been a wide spread and continued use of traditional storage practices by small - scale and subsistence farmers. Several studies on traditional methods of storing root and tuber crops (Ravi *et.al*. 1996; Ofor, 2011; Dandago and Gungula 2011; Akangbe *et.al*. 2012) have been conducted in different parts of Nigeria, but no empirical evidence exists pertaining to the analysis of socio - economic challenges of using local storage systems of root and tuber crops in Benue State. This neglect in research has caused a wide gap in knowledge as regards to socio - economic challenges of local storage systems for root and tuber crops, and results in wastage and food losses thereby affecting the income of farmers. Lack of improved affordable storage facilities has left most farmers at the mercy of marketers and middlemen, who would usually purchase their produce at relatively cheaper prices since it cannot store for long. This study, therefore, sought to fill these gaps in knowledge by investigating the analysis of the socio - economic challenges of local storage systems of root and tuber crops in Benue State, Nigeria a major producing area of these crops. Specifically, it describe the socio – economic characteristics of root and tuber crops farmers in Benue State; identifies the local storage systems for root and tuber crops in Benue State; and examines the problems associated with each of the storage systems in Benue State.

METHODOLOGY

Study Area

The study was conducted in Benue State of Nigeria. Benue State was selected because of the preponderance of root and tuber crop farmers there. The state is located in the north-central part of Nigeria between latitudes $6^0 25^/N$ and $8^0 8^/N$ and longitudes $7^0 47^/E$ and $10^0 E$. The State shares boundaries with five other states namely: Nasarawa to the North, Taraba to the East, Cross River to the south, Enugu to the south-west and Kogi to the west (Benue Agriculture and Rural Development Authority (BNARDA, 2005) It also shares a common boundary with Republic of Cameroon on the south-east and occupies a land mass of 30,955 square kilometers, with a population of 4,219,244 people (National Population Commission (NPC, 2006).

The State soils are sandy loam, sheaves basement complex and alluvial plains. The State enjoys a tropical climate with two distinct seasons. The rainy season is from April to October, while the dry season is from November to March. The annual rainfall in the state ranges from 150mm to 180mm. The temperature fluctuates between 23 and $30^0 C$. The state stretches across the transition belt between forest and savannah vegetation (ESFAJ and Partners, 2012).

Benue State is the nation's acclaimed food basket because of the abundance of its agricultural resources. The state is a major producer of food and cash crops (BNARDA, 2004). Farmers who are engaged in arable crop production like yam, cassava, sweet potato, maize, rice, vegetables, soybeans as well as livestock like poultry, goat, sheep, piggery, cattle, and fish abound.

Sampling Technique

The population for this study consisted of root and tuber crop farmers engaged in yam, cassava, and sweet potato production in the 13 Local Government Areas (LGAs) known for root and tuber crops production in the State. The LGAs are Ado, Agatu, Apa, Gwer-East, Gwer-West, Katsina-Ala, Logo, Obi, Oju, Okpokwu, Tarka, Ukum, and Ushongo Local Government Areas (ESFAJ and Partners, 2012).

A sample of 288 root and tuber crops farmers engaged in cassava, yam, and sweet potato production was selected using multi-stage sampling technique.

In the first stage, eight (8) LGAs were randomly selected from the 13 LGAs of the State with high concentration of these farmers. In the second stage, four wards were randomly selected from each of the eight (8) LGAs making a total of 32 wards. In the third stage, from each of the selected wards, three yam,

cassava, and sweet potato farmers were selected randomly, giving a sample size of 288 root and tuber crop farmers engaged in yam, cassava, and sweet potato production.

Data Collection and Analysis

The main tool for data collection for this study was a well-structured questionnaire. The questionnaire sought for information on the socio economic characteristics of root and tubers crops farmers, types of local storage methods for root and tuber crops and problems associated with each of the storage methods. Data collected were analysed with descriptive statistics like frequency distribution tables, percentages, mean and factor analysis. Factor Analysis to examine the constraints of the storage systems was specified as follows:

$Y_i = \beta_{i0} + \beta_{i1}F_1 + \beta_{i2}F_2 + \beta_{i3}F_3 + \ldots\ldots\ldots + \beta_{in}F_n + \mu_i$

Where,

Y_i = Observable variables (i.e the problems)

β_1-β_n = Parameters or loadings

F_n = Factors

μ = Stochastic error term

RESULTS AND DISCUSSION

The result of the socio - economic characteristics of respondents is summarised in Table 1. The result reveals that root and tuber crop production in the study area were dominated by males (77.3%), This could be attributed to the fact that males are likely to have access to capital which will enable them to invest in improved storage methods than the females. This finding is in agreement with Okeke, Mbanasor and Nto (2015) who posited that root and tuber producers who are mostly males have opportunity for investment capital than the females who tend to devote most of their earnings and time to their families.

Table 1: Socio – economic Characteristics of the Respondents

Socio-economic Characteristics	Frequency	Percentage	Mean
Gender			
Male	214	**77**.3	
Female	63	22.7	
Total	**277**	**100**	
Marital status			
Single	55	19.9	
Married	221	80.1	
Total	**276**	**100**	
Membership of Cooperative Society			
Non - members	166	63.1	
Members	97	36.9	
Total	**263**	**100**	
Household Size			8
< 5	63	29.4	
6 – 7	47	22.0	
8 – 10	69	32.2	
> 11	35	16.4	
Total	**214**	**100**	
Educational Level			13
< 11	67	25.5	
12 – 13	66	25.1	
14 – 16	91	34.6	
47	39	14.8	
Total	**263**	**100**	
Age			40
< 36	69	25.0	

36– 40	69	25.0	
41– 46	76	27.5	
>47	62	22.5	
Total	**276**	**100**	
Farm Size(Ha)			6.3
< 2.0	91	33.6	
2.1 – 4.0	80	29.5	
4.1 – 5.2	33	12.2	
>5.3	67	24.7	
Total	**271**	**100**	
Size of Labour Force			8
< 5	72	34.3	
5 - 7	37	17.6	
8 - 10	76	36.2	
≥11	25	11.9	
Total	**210**	**100**	
Annual income(₦)			1371815.03
<200,000.00	70	27.6	
200,000.01-500,000.00	61	24.0	
500,000.01-1,050,000.00	61	24.0	
>1,050,000.01	62	24.4	
Total	**254**	**100**	
Total Output(Kg/year**)**			62032.41
<1500.00	64	25.8	
1501.00-5800.00	60	24.2	
5801.00-37500.00	63	25.4	
>37500.00	61	24.6	
Total	**248**	**100**	

Source: Field survey data, 2017

Most respondents were married (80.1%), implying the tendency to have a high dependency ratio than the singles. This could discourage storage and investment because of high consumption of farm produce by family members and also adoption of improved storage technique will be difficult because of the high cost involved. This is in line with Giroh, Gal and Minampah (2012) who reported that farmers with large household size tend to channel more of their incomes to food consumption expenditures rather than to save and invest in improved storage technique.

Majority of the respondents were non- members of cooperatives (63.1%), and are less likely to utilise local storage techniques since cooperatives tend to educate their members on the use of improved storage techniques. This assertion is in agreement with Ufuoku *et al.,* who found out that farmers who do not subscribe to membership of cooperatives will have problems of having access to extension services and marketing of their produce.

The mean household size was found to be eight (8), implying a large household size. Families with large household size tend to utilise local storage techniques because of the high cost of adopting modern storage technique, since most of them channel their resources to consumption. This is in agreement with Giroh, Gal, and Minampah (2012) who reported that farmers with large household size tend to channel more of their income to food consumption expenditure rather than to save and invest in improved storage technique.

Educational level of the respondents was found to have a mean of 13 years, implying that most of them had up to secondary education and as such are educated enough to know and understand the complexities involved in improved technology to adopt it. This assertion is in contrast to Onemolease (2005), who reported a low educational background not exceeding primary education which may impede acceptance of improved storage technologies, since education facilitates farmers' adoption of innovations.

Furthermore, the mean age of the respondents was found to be 40 years This indicates that the respondents were in their active farming ages and had more experience to adopt improved storage techniques. This assertion is in consonance with Ikani and Ayegba (2013) who reported that young

farmers are more innovative and active at work as the older ones are weak and no longer in their productive age.

The farm size was found to have a mean of 6.3 Ha, implying that most of the respondents are medium scale farmers who have the income and can adopt improved storage techniques. This is consistent with Okoedo – Okojie and Onemolease (2009) who posited that farmers with large farms have the capacity to produce more and are more likely to use farm innovations since they are interested in preserving their produce from loss using improved technique. However, the mean size of the labour force 8. This indicates that the labour force is large enough to adopt improved storage technique that is labour intensive. This contradicts the findings of Yuguda, Girei, Dire and Salihu (2013) who reported that low availability of labour were among the major problems faced by the farmers in Taraba State of Nigeria.

The mean annual income was estimated as N1, 371,815.03.This result suggests that returns to root and tuber crop production in the study area is high enough for the respondents to adopt improved storage techniques since they have the capacity to do so. This result is in agreement with Olaoye, Ashley – Dejo, Fakoya and Ikeweinwe (2013) who reported that farmers with higher income will perform better than those with lower income since income level determines the utilization of new technology.

Finally, the mean total output of the respondents was found to be 62032.41kg/year indicating an increased output. Increased output lead to increase in income, and the farmers will need an effective storage technique to preserve their increased output. This result is in consonance with Okoedo – Okojie and Onemolease (2009) who posited that farmers with large farms have the capacity to produce more and are more likely to use farm innovations since they are interested in preserving their produce from loss using improved technique.

Root and Tuber Crops Storage Techniques

Table 2 shows distribution of respondents based on storage technique used.

Table 2: Distribution of Respondents based on Storage Technique

Storage Systems	Number of Respondents	Percentage*
Barns	181	64.64
Elevated Table	3	1.07
Elevated Horizontal Pole	16	5.71
Cribs	1	0.36
Heaps and Water	6	2.14
Trench or Clamp Silos	2	0.71
Conical Protective Roof	107	38.21
Delayed harvesting	64	22.86
Pits	48	17.14
Bagged Sand Dust	3	1.07
Box storage	1	0.36
Storage House Structure	50	17.86
Perforated cartons	2	0.71

Source : Field Survey data, 2017

*** Multiple responses existed, hence >100%**

Analysis of the result from Table 2 indicates that majority of the respondents (64.64%) used barns. Barns are mostly used for yam storage and yam is a major tuber crop farmed in Benue State. The materials used for the construction of barns are cheap and easily accessible. Besides, barn stores longer when compared to other storage facilities used. This is consistent with Osunde (2005) who revealed that materials used in constructing yam barns were readily available with little or no cost incurred. Furthermore, Nwaigwe, Okafor, Asonye and Nwokocha (2005), observed that the clay and straw used in constructing barns create a favourable temperature for stored produce, thus translating to increased produce stored. However, Ofor, Oparaeke and Ibewuchi (2010), reported that the maximum storage life of yam in barns is six months with 10% to 15% losses during the first three months and up to 30% to 50% after six months. Furthermore,

analysis of the result also showed that 38.21% and 22.86% of the respondents used conical protective roof and delayed harvesting for storage too.

Problems of Local Storage Systems

The problems associated with use of Local Storage Systems were analyzed. The result is presented in Table 3. Analysis of Table 3 shows that the major factors that constrain utilization of the local storage systems in the study area can be categorized into four components. The components are: socio-environmental factors (1), technical-know-how factors (2), input factors (3), and disease factors (4).

The study identified limited land, high cost of labour, labour unavailability, low soil fertility, lack of extension contact, poor knowledge of root and tuber technologies, poor management skills, poor storage facilities, lack of credit, high cost of planting material, rot and decay during storage, and pest and disease as the constraining variables to the local storage systems in the study area, as presented in Table 3. Based on the factor loading, the following socio-environmental components were extracted: limited land (0.726), high cost of labour (0.737), labour unavailability (0.853), low soil fertility (0.664), and lack of extension contact (0.734).

Table 3: Factor analysis of constraints of local storage systems

Constraining factors	Component			
	1	2	3	4
Rot and decay during storage				-0.664*
Poor storage facilities			0.803*	
Lack of credit			0.558*	
Pest and disease				-0.660*
High cost of planting material			0.574*	
Limited land	0.726*			
Distance from farm to market	0.557		0.554	
High cost of labour	0.737*			
Poor infrastructural facilities	0.426			0.501
Poor knowledge of root and tuber technologies		0.863*		
Labour unavailability	0.853*			
Low price of product	0.546		0.523	
Low soil fertility	0.664*			
Lack of extension contact	0.734*			
Poor feeder roads	0.438			0.583
Lack of fund to invest on root and tuber technologies		0.603		0.572
Illiteracy	0.449	0.673		
Poor management skill		0.719*		

Source: Field survey data, 2017

* Significance based on Kaiser Normalization

In spite of the advantage of no transport expenses incurred in the case of the delayed harvesting technique, it also has its disadvantage. According to Nwaigwe, Okafor, Asonye and Nwokocha (2015), large area of land is occupied over the storage period when this technique is adopted and thus, limits available land for other useful purposes. Labour plays an important role in technology adoption. Availability of labour is likely to influence the gross margin of the innovation. A farm with larger number of workers is more likely to be in a position to try and continue using a potentially profitable innovation.
Unavailability and high cost of labour have been identified to limit effective use of the local storage methods especially the storage barn. This is corroborated by Nwaigwe, Okafor, Asonye and Nwokocha (2015) who reported that the construction of barn requires a lot of work and effort and is more expensive than other local storage methods.
The deteriorating soil structure and fertility associated with shortening fallow periods has continued to result in low production of roots and tubers. This decline in output thus discourages the producers in making more investment in this enterprise and subsequently the utilization of the improved local storage method

CONCLUSION AND RECOMMENDATIONS

From the analysis, it could be concluded that majority of famers in Benue State make use of barns and conical protective roof to store their produce since the major crop farmed is yam. They also make use of delayed harvesting to store cassava. The study identified limited land, high cost of labour, labour unavailability, low soil fertility, lack of extension contact, poor knowledge of root and tuber technologies, poor management skills, poor storage facilities, lack of credit, high cost of planting material, rot and decay during storage, and pest and disease as the constraining variables to the local storage systems in the study area. Efforts are required by the government to provide credit to farmers through the root and tuber crop producers association without the burden of collateral. Information from research institutes on the utilization of improved local storage techniques should be made available to extension agents so that they can pass it across to root and tuber crops famers for adoption. Consequently, government should employ more extension workers and they should be made to visit farmers from time to time.

ACKNOWLEDGEMENT

The authors acknowledge the financial assistance provided by the Tertiary Education Trustfund (TETFund) in conducting this study.

REFERENCES

Akangbe, J.A., Oloruntoba, O.O., Ayanda, I.F. and Komolafe, S.E. (2012). An analysis of Yam Storage Strategy to Promote Food Security in Asa Local Government Area of Kwara State. *Ethiopian Journal of Environmental Studies and Management*, 5(4): 550-558.

AMCOST (2006). Technologies to reduce post-harvest food loss. The African Ministerial Council on Science and Technology (AMCOST) of the African Union (AU), Pretoria, South Africa, (2006). From http://www.nepadst.org/platforms/foodloss.shtml (Retrieved November 8, 2015).

Ayegba, O. and Ikani, D.I (2013) An Impact Assessment of Agricultural Credit on Rural Farmers in Nigeria. Research Journal of Finance and Accounting, 4(18):80 – 89

BNARDA (2005). *Implementation Completion Report on National Special Programme for Food Security, Benue State, Nigeria*. Pp 1-23

Dandago, M.A. and Gungula, D.T. (2011). Effects of Various Storage Methods on the Quality and Nutritional Composition of Sweet Potato (Ipomea batatas L.) in Yola, Nigeria. *International Food Research Journal*, 18: 271-278

ESFAJ and Partners (2012). Benue's Hidden Asset: The Young, The Gifted, The Willing. A survey and Assessment of Youth Participation and Interest in Agriculture, Benue State, Federal Republic of Nigeria. Pp 52

FAO (1981). Food Loss Prevention Perishable Crops. From http://www.fao.org/documents/htm (Retrieved November 8, 2015)

FAO (1998). Storage and Processing of Root and Tubers in the Tropics. The Food and Agricultural Organisation (FAO), Rome From <http://www.fao.org/documents/show.htm> (Retrieved November 8, 2015)

Giroh, D.Y., Gal, T.N. and Minampah, C.J. (2012). Analysis of the Determinants of Savings among Gum Arabic Collectors in Selected Local Government Areas of Adamawa State, Nigeria. *New York Science Journal*, 5(11): 1-6

Kana, H.A., Aliyu, I.A. and Chammang, H.B. (2012). Review on Neglected and Under-Utilized Root and Tuber Crops as Food Security in Achieving the Millennium Development Goals in Nigeria. *Journal of Agriculture and Veterinary Sciences*, Volume 4: 27-33

Mughogho M.J.K.(1989). Malawi: Food security issues and challenge for 1990's. In: M Rukuni (Ed.): *Food Security Policies in the SADC Region*. Harare. University of Zimbabwe and Michigan State University Food Security Research in Southern Africa Project. Department of Agricultural Economics and Extension.

Nwaigwe, K.N., Okafor, V.C., Asonye, G.U. and Nwokocha, J.C. (2015). *Analysis of Tuber Storage Techniques in Africa: A Review*. ASABE Annual International Meeting, July 26-29, New Orleans, Louisiana.

Ofor, M.O. (2011). Traditional Methods of Preservation and Storage of Farm Produce in Africa. *New York Science Journal*, 4(3): 58-62

Ofor, M.O., Oparaeke, A.M. and Ibeawuchi, I.I. (2010) Indigenous Knowledge Systems for Storage of Yams in Nigeria: Problems and Prospects

Okeke, A.M., Mbanasor, J.A. and Nto, P.O. (2015). Determinants of Investment Capacity among Yam Production Entrepreneurs in Benue State, Nigeria. *Journal of Poverty, Investment and Development*, 16: 1-8.

Okeke, A.M., Nto, P.O. and Mbanasor, J.A. (2015). Analysis of the Factors Influencing Savings and Investment Behaviour among Yam Entrepreneurs in Benue State, Nigeria. *European Journal of Business and Management.* 7(27): 205-209.

Okoedo-Okojie and Onemolease (2009). Factors Affecting the Adoption of Yam Storage Technologies in the Northern Ecological Zone of Edo State, Nigeria. *J. Hum. Ecol*., 27(2): 155-160

Omoruyi, S.A., Orhue, U.X., Ake-obo, A.A. and Akhimien, C.I. (1995). *Prescribed agricultural science for senior secondary schools*, Benin City: Idodo Umeh Publications Limited, pp. 4 – 6

Onemolease, E.A (2005) Impact of the Agricultural Development Programme (ADP) Activities in Arable Crop Production on Rural Poverty Alleviation in Edo State, Nigeria. Ph.D Thesis (Unpublished). University of Benin, Benin City, Edo State, Nigeria p123

Osunde, Z.D. (2008). *Minimizing Postharvest Losses in Yam (Dioscorea spp.): Treatments and Techniques*. In: Robertson, G.L. and Lupien, J.R. (Eds). Using Food Science and Technology to Improve Nutrition and Promote National Development. International Union of Food Science and Technology.12 pp

Osunde, Z.D. (2008). *Minimizing Postharvest Losses in Yam (Dioscorea spp.): Treatments and Techniques*. In: Robertson, G.L. and Lupien, J.R. (Eds). Using Food Science and Technology to Improve Nutrition and Promote National Development. International Union of Food Science and Technology.12 pp

Ravi, V., Aked, J. and Balagopalan, C. (1996). Review on Tropical Root and Tuber Crops: Storage Methods and Quality Changes. *Critical Reviews in Food Science and Nutrition*, 36(7): 661-709

Tyler, P.S. (1982). Misconception of food losses Food and Nutrition Bulletin 4(2), The United Nations University Press, From <http://www.unu.edu/food/8F042E05.htm> (Retrieved November 8, 2015)

Yuguda, R.M., Girei, A.A., Dire, B., Salihu, M. (2013). Socio economic factors and constraints influencing productivity among cassava farmers in Taraba State, *Nigeria. International Journal of advances in Agricultural science and technology, vol 1 pg (1- 5)*