CHALLENGES ASSOCIATED WITH ADOPTION OF AGRICULTURAL EXTENSION SERVICES AND POST-HARVEST LOSSES OF YAM AMONG FARMERS IN TARKA LOCAL GOVERNMENT AREA, BENUE STATE

Grace Nguemo Kpelai,
Elizabeth Terngu Tagher,
Margaret Bai-Tachia.
Sociology Department, Moses Orshio Adasu University, Makurdi
Email: kpelainguemo@gmail.com
08064579886

Abstract

Agricultural extension services are critical for improving productivity and reducing post-harvest losses in yam production, a staple crop and key source of income in Nigeria. This study examined the extent of adoption of agricultural extension services and the challenges yam farmers face in accessing these services in Tarka Local Government Area (LGA), Benue State. Using a cross-sectional survey design, data were collected from 400 yam farmers through structured interviews, focus group discussions, and key informant interviews with extension agents and cooperative leaders. Quantitative data were analysed using descriptive statistics, linear regression, and chi-square tests, while qualitative data were subjected to content analysis. Findings revealed that while some farmers adopt improved farm inputs, harvesting techniques, and storage methods, adoption is uneven due to low access to extension agents, poor infrastructure, inadequate funding, and socio-economic and behavioural constraints. Chi-square analysis confirmed a significant relationship between these challenges and adoption of extension services ($\chi^2 = 149.90$, df = 4, $p < 0.05$), indicating that access barriers negatively affect post-harvest loss reduction. The study concludes that adoption of extension services in Tarka LGA is limited, and post-harvest losses persist among yam farmers. Recommendations include increasing the number and capacity of extension agents, providing regular training and field demonstrations, investing in rural infrastructure, and promoting participatory approaches to enhance farmers' adoption of post-harvest technologies. These interventions are vital to improving yam productivity, reducing losses, and enhancing livelihoods in the study area.

Keywords: Challenges, Adoption of Agricultural Extension Services, Post-Harvest Losses, Yam Farmers, Benue

Introduction

Agricultural extension services play a critical role in enhancing the productivity and profitability of farmers, particularly in developing countries. These services provide farmers with essential knowledge, skills, and technologies, including improved methods of planting, harvesting, and post-harvest handling. In yam production, which is a staple crop in tropical regions and a significant source of food security and income, access to extension services can reduce post-harvest losses and increase farm income (Tanye, 2016; Food and Agricultural Organization (FAO), 2017). Despite the importance of yam in Nigeria, a substantial portion of harvested yam is lost due to poor storage, inadequate handling practices, pest infestation, and limited access to post-harvest technologies (FAO, 2017; IITA, 2016).

Several studies have highlighted the importance of agricultural extension services in promoting the adoption of improved farming practices. Swanson (2018), emphasised that extension services facilitate the flow of scientific knowledge from research institutions to farmers, thereby improving crop management and reducing losses. Similarly, Agbo, Ekele, and Amonjenu (2016). found that technical support and training provided through extension services significantly enhance farmers' ability to adopt post-harvest technologies, thereby reducing losses and improving household incomes.

However, adoption of extension services is often constrained by several factors. Fatty, Ode, and Ahule (2021), noted that in some African countries, limited access to extension agents, poor infrastructure, insufficient funding, and irregular farmer contact impede the effective use of extension services. In Nigeria, farmers in rural areas such as Tarka Local Government Area (LGA) face similar challenges, resulting in low adoption of post-harvest technologies despite the availability of services provided by ministries of agriculture and non-governmental organizations such as FAO and the World Bank (FAO, 2017; Swanson, 2018).

Research in other regions underscores the importance of understanding both adoption and access constraints. For instance, Tyler, Kader, and Rolle (2018), found that in Latin America, effective extension programmes reduced post-harvest losses through improved storage, treatment of tubers, and farmer training. In Asia, controlled atmosphere technologies and cold storage solutions demonstrated that knowledge dissemination through extension services directly influenced adoption rates and reduced crop losses (Fatty, Ode, & Ajir, 2021). These findings suggest that while the technologies exist, the extent of adoption depends on farmers' access to services and their ability to implement recommended practices.

In Nigeria, particularly in Benue State, yam production is highly significant, yet post-harvest losses remain a major concern. Reports indicate that only 43% of yam-harvesting households sell part of their produce, highlighting the economic and food security implications of post-harvest losses (IITA, 2016; National Bureau of Statistics (NBS), 2018). The challenges encountered in accessing extension services may include limited availability of extension agents, poor communication, and inadequate knowledge transfer, all of which reduce the effectiveness of adoption of extension services in mitigating post-harvest losses (Agbo, Ekele, & Amonjenu, 2016).

Understanding the extent of adoption and access constraints is critical to enhancing the effectiveness of agricultural extension services in Tarka LGA. This study seeks to examine how yam farmers adopt agricultural extension services and the challenges they face in accessing these services, with a view to improving post-harvest management and farmers' livelihoods in the area.

Research Questions

The following questions were used in the study

1. What is the extent of adoption of agricultural extension services in minimizing post-harvest losses of yam among farmers in Tarka LGA?
2. What challenges do yam farmers encounter in accessing agricultural extension services in reducing post-harvest losses of yam in Tarka LGA?

Research Objectives

The specific objectives of the study include to:

1. Assess the extent of adoption of agricultural extension services in minimizing post-harvest losses of yam among farmers in Tarka LGA.
2. Examine the challenges yam farmers encounter in accessing agricultural extension services in reducing post-harvest losses of yam in Tarka LGA.

Research Hypothesis

Ho1: The adoption of agricultural extension services has no significant effect on minimizing post-harvest losses of yam among farmers in Tarka LGA.

Conceptual Clarification

Agricultural Extension Services

Agricultural extension services are structured systems through which farmers receive technical information, training, and support aimed at improving agricultural productivity, sustainability, and income (FAO, 2018). These services include demonstrations, field visits, workshops, advisory services, and dissemination of innovations in crop cultivation, pest management, soil fertility, and post-harvest handling (Rivera & Qamar, 2019). Scholars conceptualize agricultural extension as both a knowledge transfer mechanism and a link between research institutions and farmers, ensuring that modern agricultural practices are adapted to local contexts (Anderson & Feder, 2007). In Nigeria, extension services are delivered primarily through government agencies, non-governmental organisations, and private operators, but coverage is often constrained by limited personnel and resources (Ogunleye et al., 2020). In this study, agricultural extension services refer to the formal and structured provision of information, guidance, and support to yam farmers in Tarka Local Government Area aimed at enhancing their farming practices and output.

Adoption

Adoption in agricultural research refers to the decision by a farmer to make full use of a new agricultural technology or practice (Rogers, 2003). It is a process that begins with awareness, proceeds through evaluation and trial, and culminates in consistent use (Doss, 2006). Adoption is influenced by individual, socio-economic, and institutional factors, including perceived benefits, farm size, income, access to information, and extension services (Asfaw et al., 2012). For yam farmers, adoption may involve using improved yam varieties, fertilisers, pest control methods, or modern post-harvest techniques. In the context of this study, adoption is understood as the extent to which yam farmers implement recommendations provided by agricultural extension agents in Tarka Local Government Area.

Access Constraints

Access constraints refer to factors that limit farmers' ability to obtain and utilise agricultural extension services effectively (Cattaneo et al., 2021). These constraints may be structural, such as poor infrastructure, insufficient extension personnel, or inadequate funding; economic, such as high cost of inputs or transport; informational, such as lack of awareness; or socio-cultural, such as gender norms or resistance to innovation (Mignouna et al., 2014; Ogunleye et al., 2020). Scholars argue that addressing access constraints is critical for improving adoption rates of agricultural innovations and enhancing productivity (FAO, 2017). For this study, access constraints encompass all challenges economic, social, institutional, and infrastructural—that hinder yam farmers in Tarka LGA from fully benefiting from extension services.

Yam Farmers

Yam farmers are individuals or households engaged in the cultivation of yams (Dioscorea spp.) for subsistence or commercial purposes (Onwueme & Charles, 1994). Yam is a staple crop in Nigeria and serves as a source of food security, income, and employment (IITA, 2019). The productivity of yam farming is closely tied to the adoption of improved cultivation and post-harvest practices, which are typically promoted through extension services (Asiedu & Sartie, 2010). In this study, yam farmers refer specifically to smallholder farmers in Tarka Local Government Area who rely on yams as a primary source of livelihood.

Extent of Adoption of Agricultural Extension Services in minimizing post-harvest losses of Yam

Several studies indicate that post-harvest losses of yam remain a major challenge in Nigeria, particularly in Benue State, affecting farmers' income and food security (Mignouna et al., 2014). Agricultural extension services play a crucial role in minimizing these losses by providing farmers with information, training, and technologies, including improved storage techniques, curing, chemical sprout inhibitors, and ventilated barns (IITA, 2018; Opara, 2013). Awareness and accessibility of extension services are often constrained by limited personnel, poor funding, inadequate infrastructure, and cultural resistance to new methods (FAO, 2019; Onyeka, 2014), while literacy levels and access to digital media further influence adoption. Technology transfer through demonstration farms, pilot programs, and linkages with research institutions has facilitated adoption, though high costs and lack of locally manufactured equipment remain barriers (Amusa et al., 2011; Asiedu, 2017). Farmer training and capacity-building programs, including workshops and field schools, have proven effective in equipping farmers with skills to reduce post-harvest losses (Mignouna et al., 2014; Aidoo et al., 2011), and participatory approaches enhance experiential learning and peer-to-peer dissemination (Agba et al., 2019).

Adoption of yam technologies depends on multiple factors, including personal characteristics, innovation attributes, psychological readiness, and situational constraints such as access to credit and markets (Schwartz & Zijp, 2014; Ojiya et al., 2021). Evidence from global and regional initiatives, such as the Philippines' PHTRC, the African PTSC programs, and Sub-Saharan Africa extension reforms, demonstrates that structured post-harvest training and pluralistic extension models can significantly reduce losses, improve incomes, and enhance food security (Rola et al., 2012; Hodges et al., 2014; Rivera & Zijp, 2012). Despite these interventions, challenges remain, including low adoption of improved seeds, heterogeneous farmer demand, and financial constraints, highlighting the need for continued policy support, access to credit, and tailored

extension strategies to ensure that yam farmers fully benefit from post-harvest technologies (Okoedo-Okojie & Onemolease, 2017; Emongór et al., 2009).

Challenges Yam Farmers encounter in accessing Agricultural Extension Services in reducing Post-harvest losses of Yam

Yam farmers face several challenges in accessing agricultural extension services, which limits their ability to reduce post-harvest losses. A major constraint is the low extension officer-to-farmer ratio, where one officer may serve thousands of farmers, making personalized support difficult (FAO, 2019). Limited funding for extension programs further constrains their effectiveness, as many Agricultural development programmes (ADPs) lack resources for training, demonstration materials, and field visits (Asiedu, 2017). Infrastructural deficits, such as poor road networks and inadequate communication facilities, also hinder extension officers from reaching remote communities, leaving farmers uninformed about modern post-harvest management strategies (Mignouna et al., 2014).

Farmer attitudes and perceptions play a critical role in the adoption of extension services. Resistance to change, preference for traditional methods, and lack of trust in extension agents often reduce farmers' engagement with new technologies (Opara, 2013). The competency of extension workers, including technical knowledge, communication skills, and ability to conduct field demonstrations, is another factor influencing service effectiveness. Many extension officers are engaged in ad-hoc activities that limit their capacity to implement regular programs (Natural Resource Training Institute, 2015). Motivation and supervision also affect service delivery. Poor remuneration, lack of recognition, and inadequate monitoring discourage extension agents, resulting in limited contact with rural farmers (Oluwole & Onwubuya, 2017).

Institutional and systemic constraints compound these challenges. Insufficient training facilities, inadequate technology for rural farmers, and inconsistent monitoring and evaluation systems reduce the effectiveness of extension services (FAO, 2011; 2017). Low extension coverage rates in many Nigerian states for example, 1:10,568 in Bayelsa and 1:9,409 in Anambra highlight the difficulty of reaching smallholder farmers (Anaeto et al., 2012). Collectively, these factors limit farmers' exposure to improved post-harvest practices, hinder the adoption of modern technologies, and perpetuate losses along the yam value chain (Chegere et al., 2020; Hodges et al., 2014).

Addressing these challenges requires investment in extension personnel, improved infrastructure, targeted training, better funding, and enhanced supervision and motivation systems. Strengthening institutional capacity and ensuring consistent monitoring can enhance the adoption of post-harvest technologies, ultimately reducing losses and improving farmers' livelihoods.

Diffusion of Innovations Theory

Diffusion of Innovations Theory, developed by Everett Rogers in 1967, is a theoretical framework used to explain how new ideas, practices, or technologies are communicated and adopted within a social system over time. The theory emphasises the process by which an innovation is introduced, communicated, and either adopted or rejected by members of a community (Rogers, 2003). In the context of yam farming in Tarka Local Government Area, agricultural extension services and post-harvest technologies represent the innovation, while yam farmers are the adopters whose behaviours, attitudes, and decisions determine the rate and extent of adoption.

Rogers identified four key elements in the diffusion process: the innovation itself, communication channels, time, and the social system. Innovations are perceived as new ideas or practices by the adopters and their adoption is influenced by factors such as relative advantage, compatibility, complexity, trialability, and observability. Communication channels, both interpersonal (e.g., farmer-to-farmer or extension agent-to-farmer) and mass media (e.g., radio, posters), play a crucial role in raising awareness and shaping farmers' attitudes toward adoption. Time is another critical element, reflecting the gradual process through which farmers move from initial awareness to full adoption. The social system, which includes community norms, peer influence, and local institutions, affects how farmers respond to innovations and the support they receive during the adoption process.

The innovation-decision process described by Rogers includes five stages: knowledge, persuasion, decision, implementation, and confirmation. At the knowledge stage, farmers learn about the innovation and understand its purpose and usage. In the persuasion stage, farmers form attitudes based on perceived benefits and social influence. The decision stage involves choosing whether to adopt or reject the innovation, often after partial trials. Implementation refers to the actual application of the innovation in farming practices, and confirmation involves evaluating its effectiveness and continuing its use if successful.

Applying Diffusion of Innovations Theory to this study helps explain how agricultural extension services and post-harvest technologies are adopted by yam farmers in Tarka LGA. It provides a framework for understanding both the extent of adoption and the access constraints that limit effective use of innovations. By analysing these stages and factors, the study can identify strategies to improve dissemination, encourage adoption, and ultimately reduce post-harvest losses of yam among farmers.

Methods

Research Design

This study adopted a cross-sectional survey design to collect data from yam farmers, extension agents, and cooperative leaders at a single point in time. This design allowed observation of adoption of agricultural extension services and post-harvest losses without influencing respondents.

Study Setting

The study was conducted in Tarka Local Government Area (LGA), Benue State, Nigeria, predominantly inhabited by Tiv people alongside Idoma, Igede, Hausa, Igbo, Yoruba, and Fulani settlers. Tarka covers 2,891 km² with ten council wards. Agriculture is the mainstay, with yam cultivation being a major occupation and cultural symbol. The prominence of yam farming and its contribution to household income justified selecting Tarka LGA as the study area.

Population

The population comprised yam farmers with at least three years of experience and exposure to post-harvest losses, along with extension agents and leaders of yam cooperative societies. The total yam farmer population was 2,023 (All Farmers Association, 2023).

Sample Size

Using Taro Yamane's (1967) formula with N=2,023N = 2,023N=2,023 and e=0.05e = 0.05e=0.05, the sample size was 400 respondents.

Sampling Technique

The study employed a multistage sampling technique. First, cluster sampling was used to group Tarka Local Government Area into three major clusters: Mbalahan, Mbachoughul, and Mbajir.

Secondly, purposive sampling was applied to select four council wards—Tongov, Mbaayo, Mbanyagber, and Shitile based on the intensity of yam farming activities. One village was further purposively selected from each ward (Asukunya, Agudo, Uchi, and Uvande). Finally, simple random sampling through balloting was used to select 100 yam farmers from each village, resulting in a total sample of 400 respondents. This procedure ensured adequate representation of yam farmers across the selected wards while reducing sampling bias.

Instruments of Data Collection

Data for the study were collected using structured interviews, focus group discussions (FGDs), and key informant interviews (KIIs). Structured interviews were administered to 400 yam farmers using both open- and closed-ended questions covering socio-demographic characteristics, causes of post-harvest losses, extent of adoption of agricultural extension services, effects of extension services, and challenges encountered in accessing them. In addition, eight FGDs were conducted, with 8–10 participants per group and separated by gender to encourage free participation. Furthermore, key informant interviews were carried out with four agricultural extension agents and eight leaders of yam cooperative societies to obtain in-depth and expert insights on extension service delivery and access constraints.

Validation

The study ensured face and content validity of the research instruments through expert review. Specialists in agricultural extension and social research examined the instruments for clarity, relevance, and alignment with the study objectives. Necessary corrections were made based on their recommendations. Test-retest reliability was conducted to determine consistency over time, and a reliability coefficient of 0.72 was obtained, indicating that the instruments were reliable.

Techniques of Data Analysis

Quantitative data were analysed using Statistical Package for Social Sciences (SPSS) version 23 and Microsoft Excel 16. Descriptive statistics such as frequencies and percentages were used to summarize the data, while inferential statistics were employed to test relationships. Linear regression analysis was used to assess the effect of agricultural extension services on post-harvest losses of yam, while chi-square analysis examined the challenges farmers encounter in accessing extension services. Qualitative data from FGDs and KIIs were analysed using content analysis, and findings from both quantitative and qualitative data were triangulated to strengthen the validity of the results.

Findings

Socio-demographic characteristics of respondents.

Analysis of socio-demographic characteristics of the respondents shows most of the respondents, 205 (58.2%), were within the age category of 41–50 years. The table also shows many of the respondents, 194 (55.1%), were male. The table again shows majority, 297 (84.4%), of the respondents were married. Most of the respondents, 309 (87.8%), were Christians. The table further shows that many of the respondents, 200 (56.8%), had 1–4 children. Lastly, the table shows most, 220 (62.5%), cultivated between 1–2 hectares and 205 (58.2%) had 10–20 years of yam farming experience.

Table 1: Socio-demographic characteristics of yam farmers

Variables	Frequency (352)	Percentages (%)
Gender		
Male	194	55.1
Female	158	44.9
Marital Status		
Married	297	84.4
Divorced	10	2.8
Widow(er)	36	10.2
Single	7	2.0
Separated	2	0.6
Age		
Below 30yrs	12	3.4
31-40yrs	101	28.7
41-50yrs	205	58.2
51-60yrs	20	5.7
61yrs and above	14	4.0
Number of Children		
None	110	31.3
1-4	200	56.8
5-8	42	11.9
Level of Education		
FSLC	102	29.0
Ordinary Level	152	43.2
Advanced Level	50	14.2
Degree	44	12.5
None	4	1.1
Religion		
Christianity	309	87.8
Islam	11	3.1
Traditional	20	5.7
None	12	3.4
Farm Size		
Below 1 Hectre	72	20.5
1-2 Hectres	220	62.5
3 Hectres above	60	17.0
Years of Yam Cultivation		
Below 10yrs	17	4.8
10-20yrs	205	58.2
21-30yrs	130	36.9

Extent of Adoption of Agricultural Extension Services in Minimizing Post-Harvest Losses of Yam in Tarka LGA

The findings show that some respondents adopt farm inputs such as fertilizers and herbicides provided through extension services, which help to improve yield and reduce losses. Some adopt improved harvesting techniques, while others adopt planting and tillage techniques introduced by extension agents. Some farmers also adopt processing, storage, and preservation methods to minimize spoilage after harvest. However, some respondents do not adopt any of the recommended techniques due to various constraints. Overall, the findings indicate that while a good number of farmers adopt certain extension services, adoption is not universal among yam farmers in the study area.

Table 2: Extent of adoption of Agricultural Extension Services in Minimizing Post-Harvest Losses of Yam

Category of Service	Nature of Service Provided	Adopted		Frequency (352)	Percentage (%)
		Yes	No		
Farm inputs	Fertilizers/ Herbicides	252	0	253	71.6
	None	100	0	100	28.4
Techniques	Tillage techniques	42	0	42	11.93
	Planting techniques	33	0	33	9.38
	Weeding techniques	25	0	25	7.10
	Harvesting techniques	61	0	61	17.33
	Sorting techniques	22	0	22	6.25
	Storage and Preserving Techniques	28	0	18	7.95
	Post-harvest loss reduction techniques	23	0	15	6.53
	Processing techniques	38	0	38	10.79
	None	80	**0**	80	22.73

Source*:* Field work 2024

Challenges Yam Farmers Encounter in Accessing Agricultural Extension Services

The findings show that some respondents experience poor access to extension services due to the low number of extension agents available to attend to farmers. Some face challenges such as poor road networks and inadequate communication facilities, which limit contact with extension personnel. Some respondents report insufficient funding of extension programmes as a barrier, while others mention lack of sustained training and inadequate technical support. Some farmers also indicate fear of financial risk and negative attitudes toward new innovations as constraints. Overall, the findings reveal that both institutional and farmer-related factors hinder effective access to and utilization of agricultural extension services in the study area.

Table 3 Challenges yam farmers encounter in accessing agricultural extension services in reducing post-harvest of yam in the study area.

Challenge	Frequency (n=352)	Percentage (%)
Challenges in Accessing Extension Services		
Low extension officer-to-farmer ratio	134	38.1
Limited funding for extension programs	102	29.0
Infrastructural deficits (e.g., poor road networks, communication facilities)	116	33.0
Challenges in Adopting Extension Services		
Farmer attitudes and perceptions (lack of trust, fear of financial risk)	97	27.6
Lack of effective medium or long-term training approaches	89	25.3
Lack of qualified manpower with relevant experience	100	28.4
Over-reliance on extension via mass media	66	18.8

Source: Field Work 2024

Test of Hypothesis

Ho; There is no significant challenges yam farmers encounter in accessing agricultural extension services in reducing post-harvest of yam in the study area.

Table 4. Chi-square (x^2) showing the association between challenges yam farmers encounter in accessing agricultural extension services in reducing post-harvest of yam in Tarka LGA.

x^2 calculated value	x^2tabulated value	df	p-value	Significance	Decision
149.90	9.49	4	0.05	.000	Accepted

Source: Field Survey, 2024.

Table 9 showed that descriptive and influential statistic chi-square (x^2) was used to determine the association between challenges yam farmers encounter in accessing agricultural extension services in reducing post-harvest of yam in Tarka LGA. Finding revealed that the chi-square (x^2) calculated value of 149.90 is greater than the chi-square (x^2) tabulated value of 9.49 checked at 0.05 level of significance at 4 degree of freedom (df). Based on the above result, the study accepts Hi and reject Ho, it then means that there is significant relationship between challenges yam farmers encounter in accessing agricultural extension services in reducing post-harvest of yam in Tarka LGA. It also means that challenges yam farmers encounter in accessing agricultural extension services has negative effect in reducing post-harvest of yam in Tarka LGA, therefore effect should be made to reduce these challenges in order to reduce postharvest losses of yam in the study area.

Discussion of Findings

Extent of Adoption of Agricultural Extension Services in Minimizing Post-Harvest Losses of Yam

The study revealed that the adoption of agricultural extension services among yam farmers in Tarka LGA is varied. Some respondents adopted farm inputs such as fertilizers and herbicides, improved harvesting, planting, and tillage techniques, as well as storage, preservation, and processing methods. This demonstrates that a portion of farmers are aware of post-harvest loss reduction practices and actively apply them. However, a significant proportion of farmers did not adopt any of the recommended practices due to constraints such as limited access to extension agents, infrastructural challenges, and socio-economic limitations.

These findings align with earlier studies which emphasize that adoption of post-harvest technologies depends on access to information, training, and technologies, but is often limited by inadequate infrastructure, insufficient personnel, and financial barriers (Mignouna et al., 2014; FAO, 2019; Onyeka, 2014). The study further supports reports that farmer participation in training programs, demonstration farms, and cooperative engagements enhances adoption, although uneven access leads to disparities in post-harvest outcomes (Agba et al., 2019; Aidoo et al., 2011).

Challenges Yam Farmers Encounter in Accessing Agricultural Extension Services

The findings indicate that yam farmers face multiple challenges in accessing agricultural extension services, which negatively impacts adoption. Key constraints include a low extension officer-to-farmer ratio, inadequate funding, poor road networks, insufficient communication facilities, and lack of sustained training programs. Additionally, farmer attitudes, including resistance to change and lack of trust in extension agents, further hinder uptake of services.

These results corroborate existing literature, which identifies institutional, systemic, and behavioral factors as major barriers to effective extension delivery (Asiedu, 2017; Opara, 2013; Anaeto et al., 2012). The chi-square analysis conducted in this study confirmed a significant association between these challenges and adoption of extension services. This indicates that overcoming such barriers is essential for increasing farmers' engagement with recommended post-harvest practices and improving overall adoption rates

Conclusion and Recommendations

The conclusion here is derived from the findings of this study. The study provides justification to the objectives for which it was instituted and also provides answers to the stated research questions. The research revealed that; some farmers adopt farm inputs, improved harvesting, planting, and storage techniques, while many do not adopt recommended practices due to low access to extension services, poor infrastructure, and socio-economic or behavioral barriers. The research concludes that adoption of agricultural extension services in minimizing post-harvest losses of yam is uneven and limited in Tarka Local Government Area.

In the light of the findings and conclusions of this study, the following recommendations are made; Farmers should be trained regularly on improved harvesting, handling, storage, and preservation techniques. The government should address the number of extension agents to provide timely and practical advisory services. Extension agents should conduct field demonstrations and follow-up visits to support adoption of recommended practices. Extension services should cover the entire

yam value chain, and investments in rural roads, communication facilities, and farmer groups should be prioritized to enhance service delivery.

References

Agba, S.A., Ode, I., Ugbem, C. & Nwafor, S.C. (2019). Impact of Yam Post harvest Activities on Standard of Living of Yam Farming Households in North-East Zone of Benue State, Nigeria. *Journal of Applied Life Sciences International, 21(1): 1 – 9.*

Agbo, T.O.O., Ekele, G.E. & Amonjenu, A. (2016). Evaluation of Harvest and Post-Harvest Skills in Yam (Doiscorea spp) Production Possessed by Agricultural Education Students in Colleges of Education in North-Central Nigeria. *Scholarly Journal of Agricultural Science, 6(6): 162 – 168.*

Anderson, J.R. & Feder, G. (2007). Agricultural Extension: Good Intentions and Hard Realities. The World Bank Research Observer, 19(1), 41-60.

Asfaw, S., Shiferaw, B., Simtowe, F. & Lipper, L. (2012). Impact of modern agricultural technologies on smallholder welfare: Evidence from Tanzania and Ethiopia. Food Policy, 37, 283–295. https://doi.org/10.1016/j.foodpol.2012.02.013.

Cattaneo, A., Sánchez, M.V., Torero, M. & Vos, R. (2021). Reducing food loss and waste: Five challenges for policy and research. Food Policy, 98, 101974. https://doi.org/10.1016/j.foodpol.2020.101974.

FAO (2017). Save food: Global initiative on food loss and waste reduction. Key facts on food loss and waste you should know. http://www.fao.org/3/i7657e/i7657e.pdf.

FAO (2018). Regional Overview of Food Security and Nutrition in Africa 2017. The food security and nutrition–conflict nexus: building resilience for food security, nutrition and peace. Accra.

Fatty, L.K.M., Ode, I.D. & Ahule, B.G. (2021). Horticultural Farmers' Access to Agricultural Extension Information on Post-Harvest Technology in Kombo Central and North, West Coast Region, The Gambia, *International Journal of Advanced Economics, Volume 3, Issue 2, P.No. 26-39,*

Fatty, L.K.M., Ode, I.D. & Ajir, I. (2021). The Agricultural Extension Services Mode of Operation in Horticultural Schemes in West Coast Region in Kombo Central and North of The Gambia, *International Journal of Advanced Economics Volume 3, Issue 2, P.No. 40-57,*

Hodges, R., Bernard, M. & Rembold, F. (2014). Post harvest cereal losses in Sub-Saharan Africa, their estimation, assessment and reduction, European Union, Luxembourg City, Luxembourg, p. 160, https://doi.org/10.2788/19582

IITA. (2016). Project Thirteen. Improvement of Yam-based systems: Annual Report, 2016. Ibadan: IITA. In Offori, F. and Hahn (eds.) Proceedings of the Ninth symposium of the International Society for Tropical Root Crops, October 2016, Accra: ISTRC.Italy, pp 181-183.

IITA. (2019). Africa RISING in Tanzania. Country Brief, Ibadan, Nigeria. https://hdl.handle.net/10568/101478. Accessed 17 December 2021.

Ogunleye, O.O., Adepoju, A.O., Olawuyi, O.A., & Adebayo, M.O. (2020). Agricultural Extension Services in Nigeria: Challenges and Policy Options. *Nigerian Journal of Rural Development, 3(1): 1-12.*

Oluwole, F.A. & Onwubuya, E.I. (2017). Constraints to Agricultural Extension Service Delivery in Rural Nigeria. *Journal of Agricultural Extension, 21(2): 45-56.*

Opara, L.U. (2013). Postharvest Technology of Perishable Crops in the Tropics. University of Nigeria Press.

Rivera, W.M. & Qamar, M.K. (2019). Agricultural Extension and Rural Development. Food and Agriculture Organization, Rome.

Rogers, E.M. (2003). Diffusion of Innovations. 5th Edition. New York: Free Press.

Schwartz, S. & Zijp, W. (2014). Adoption of Agricultural Innovations in Africa: Lessons from Past and Present Interventions. Food Policy Journal, 49, 1-12.

Swanson, B.E. (2018). Global Review of Good Agricultural Extension Practices. Rome: FAO.

Tanye, A. (2016). Post-Harvest Handling of Root Crops in West Africa. *Journal of Tropical Agriculture, 54(2), 34-42.*

Tyler, J., Kader, A. & Rolle, R. (2018). Reducing Post-harvest Losses through Effective Extension Programs in Latin America. Post-Harvest Review, 12(3), 14-25.