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Original Research

Communication Methods' Efficacy in Getting Smallholder Farmers to Embrace Orange Fleshed Sweet Potato (OFSP) Technology in Gwagwalada, FCT, Nigeria

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ABSTRACT: The study's purpose was to determine whether smallholder farmers in Gwagwalada were effectively adopting orange-fleshed sweet potato (OFSP) technologies through communication channels. SPSS version 24 was used to enter and analyze the questionnaire/data. The study variables were merged using descriptive statistics such as frequencies, percentages, mean scores, and standard deviation. The following objectives were used as the study's guiding principles: to elucidate the socioeconomic characteristics of sweet potato farmers, to pinpoint the communication channels used to disseminate OFSP technologies, to discover the reason for their rejection of the innovative technologies, and to determine the best means of communication to use to disseminate information to OFSP farmers. To learn about the challenges, 120 questionnaires were provided to OFSP farmers who were chosen at random. Journals and publications were evaluated as secondary data. Questionnaires and interviews were used to collect primary data. The researcher concluded that ICT is the most effective mode of communication for disseminating OFSP technologies to farmers. The medium of communication also has a big impact on technological adoption. According to the report, bad network, insufficient facilities, and a lack of awareness of internet applications, particularly cyber extension, are impeding access to technology diffusion. According to the study, it is vital to make an effort to increase cyber expansion as well as improve social facilities in rural areas. Electricity supply (mobile phone network, radio and television transmissions).

Keywords: Communication, channel, adoption, technologies, farmers
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INTRODUCTION

Nigeria ranks second among countries that produce sweet potato in the world after China with an annual output of 3.46 annual million metric tons Udemezue, (2019). Orange fleshed sweet potato (OFSP) *(Ipomoea batatas*) is a special type of bio-fortified sweet potato (SP) that contains high levels of beta-carotene. There are three varieties of OFSP released in Nigeria namely: UMU SP 002 also known as King J, released in December 2012. UMU SP 003 also known as mother's delight released in June 2013 and UMU SP 004 also known as Solo gold released in June 2018. An abundant organic red-orange pigment found in plants and fruits is beta-

carotene. OFSP's orange color is a result of beta-carotene, which is then changed into vitamin A in the body for added nutritional value after ingestion. Bio-fortification increases a crop's concentration of vitamins and minerals using conventional plant breeding, agronomic methods, or biotechnology, improving the nutritional value of basic food crops. Pro vitamin A, carotenoids, zinc, and iron are some of the vitamins and minerals that can be boosted through bio-fortification (Oyewole and Sennuga, 2020). Supplementation and elemental fortification are two methods used to treat vitamin A insufficiency; both have been shown to be effective but slow in doing so (Pritwani and Mathur, 2015). By conventionally breeding some crops to have higher quantities of vital micronutrients, bio-fortification is utilized to reduce micronutrient deficiency (USAID, 2016). The bio-fortified orange-fleshed sweet potato (OFSP) cultivar has a high concentration of beta-carotene, which is a precursor to vitamin A. Beta-carotene levels vary among different sweet potato types. Due to their higher beta-carotene and consequently higher vitamin A content, orange-fleshed sweet potato roots have a nutritional advantage over white- or cream-fleshed sweet potato roots. The flesh of the sweet potato exhibits a deep orange color, which is indicative of its increased beta-carotene and vitamin A content. The kinds with the darkest or most vibrant orange flesh have the largest concentrations of beta-carotene and vitamin A. Because they are affordable, orange-fleshed sweet potato roots are another suggested source of vitamin A. Low et al. (2017) in their research discovered that OFSP is one of the cheapest sources of vitamin.

When it comes to the social and economic development of developing countries, effective communication is a key tool for achieving desired change opined by Akinbile and Otitolaye (2008). To effectively communicate, the source must exhibit dependability, likeability, and honesty. Tziovaras (2008). All of these definitions concur that for communication to be effective, the message must be understood by the recipient. In reality, they fail to take into account the possibility that the information may never reach the audience that needs it, especially if the distribution method is not approved by the group that will use it. The source, message, and channel variables of the McGuire's model, which each define how each influences communication and persuasion, are connected to the three components of communication effectiveness (Tziovaras, 2008). However, Hartman et al., (2014) stated that the reach is thought to be influenced by the communication channel element. Accessibility, usability, technical quality, and frequency of usage are the four criteria to assess an information source. Every medium, however, has its own distinctive qualities, including sensory appeal (e.g., visual vs not), degree of engagement, and ability to reach particular audiences (Kreuter and McClure, 2004). If communicators use channels that are frequently used by a community to increase the persuasiveness of information, information may reach the target group more successfully (Hartman et al., 2014). Furthermore, efficacy of communication channels can be defined as the process by which a source is successful in persuading a certain audience to comprehend and adopt an idea. This description is thought to be relevant because it shows that particular channels are meant to persuade various audiences (Okwu, 2011; Adwola et al. 2012).

A number of hypotheses have been put up to explain the connection between the efficacy of communication channels and the adoption of OFSP. Jirgi et al., (2009), argued that a farmer should be aware of innovations before implementing them. According to Okwu (2011), farmers must receive knowledge about new technology through efficient extension and media channels in order to embrace and use them. According to Adwola et al. (2012), research institutions and extension personnel should employ ICTs to complement community-based channels for the transmission of technology in order to provide faster and more effective information delivery. According to these claims, a farmer needs a channel to learn about a technology. They neglected to mention the method by which an innovation spreads among farmers, nevertheless. As knowledge can be acquired by observation, a farmer won't need require a medium to be informed about a useful technique. Promoters of OFSP should also make sure that early adopters' efforts spur other people to use the technology. The relationship between the effectiveness of communication channels and adoption should be defined by dependability, likeability, honesty, accessibility, interactivity, credibility, familiarity, utility, and technical quality in light of the difficulties highlighted above (Sennuga et al., 2020).

In the study of distribution of maize farmers through means of sources that provide knowledge on specific technologies for extension/recommendation by (Fadiji et al., 2005), radio was rated as the most notable origin of information followed by extension agents. It was relatively discovered that farmers serve as facilitators of information and its dissemination on extension cum farm practices. This was apportioned third position. Agricultural shows took fourth position as a veritable source of extension information. The study gave village heads fifth position as source of agricultural extension information. The use of slide and film shows was established by the study ranking sixth position. Traders of farm inputs were also known to be good source of agricultural extension information taking the seventh position etc. in the same manner, (Onasanya et al., 2006), discovered that radio, television, audiotapes, group discussions/meeting shows/exhibition, and small plot adaptive techniques were the top sources of

information for farmers. On-farm adaptive research, method and outcome demonstrations, and posters follow. With the exception of audiotapes, which are utilized by just 36.0% of the agents, the majority of the agents made the same claim about the use of the methods. Both studies suggest that radio is the best and fastest way for technology to be disseminated that most farmers can afford to listen to farming programs (Fadiji and Sennuga, 2020; Adeyongo et al., 2022).

Adoption - diffusion theory

The adoption-theory, which explains why farmers choose to adopt new ideas, is the driving force behind this study on the effectiveness of communication channels and small holders' farmers' adoption of orange fleshed sweet potatoes (Aluko et al. 2021). The innovation itself and the characteristics of the receivers influence the amount of time and adoption rates. Adoption - Diffusion theory is helpful in adoption since it forecasts how and at what rate an innovation will be embraced by farmers in a community, claim Van de Ban and Hawkins (2010). Also, by applying the theory, the channels of communication can help farmers cultivate an open mindset, leading to better acceptance of specific technology.

Theories on adoption

Farmers must consider a variety of issues before deciding whether to accept innovation. Understanding why a person might choose to adopt one technology while rejecting another is crucial to understanding the adoption characteristics in the context of technology (Bergh et al., 2010). In light of this research, farmers' readiness to adopt innovations constitutes user approval. Regarding the aforementioned, attention is concentrated on determining the variables that affect how consumers who have some degree of choice embrace technology. Therefore, it is improbable that a single variable explanation could explain why certain farmers would accept or reject a technology given the large range of difficulties involved. Based on this, several ideas have been established to help comprehend and explain the end user adoption process (Sennuga, 2019). As adoption is a multi-step procedure, it requires awhile for it to be finished. When farmers use new technology, communication may be considered to be successful and efficient (Aphunu and Otoikhian, 2011). Adoption is therefore comparable to diffusion, with the exception that it focuses on the psychological instead of the physical processes that a person goes through.

Farmers typically have relatively poor crop yields since the native varieties they employ have low potential yield, the majority of the maize is produced in rain-fed circumstances, irrigation is only utilized in a few places, fertilizer use is minimal to nonexistent, and pest management is insufficient (Sennuga et al., 2020). As a result, increasing agriculture's output and sustainability is urgently needed on a global scale, but there is a lack of information on how to do so, particularly in the research region. Similar research has been done on smallholder farmers' adoption of new technologies and their impacts. However although while improved agricultural technology is seen as a key to ending poverty in the majority of developing countries, it is typically implemented slowly, and a number of adoption-related factors are still poorly understood (Adeyemi et al., 2023).

OBJECTIVES

This study's main goal is to investigate the types of communication media used and how well they work for promoting the use of orange-fleshed sweet potato (OFSP) technologies in FCT-Nigeria. The act of adopting an idea or new innovation does not occur in a single act, but rather is a mental process that involves at least five steps, including awareness, interest, appraisal, trial, and adoption (Rogers, 2013, Oyewole and Sennuga, 2020). At this moment, a person learns about the concept, but they are still unsure of it. When something piques someone's curiosity, they want to learn more about it, including how it works, what it is, and its advantages. when the user has learned more from the other phases and is in the third mental stage. At the fourth mental stage, the person tests the concept on a small scale and asks for specifics to be clarified in order to respond to queries. Adoption, the final mental stage, is conceptualized by widespread usage of the concept and, most significantly, by ongoing use of it. The specific objectives are to:

(a) Describe the socio-economic characteristics of orange fleshed sweet potato (OFSP) farmers on adoption of OFSP technologies in the study area.
(b) Analyse the improved OFSP technologies adopted by farmers in the research area;
(c) Highlight the sources of information on adoption of technologies by Orange Fleshed sweet potato farmers in the study area.
(d) Investigate the effectiveness of communication channels Used to disseminate Orange Fleshed sweet potato technologies for adoption.

MATERIALS METHODS

Study area

The Federal Capital Territory (FCT), which has an area of 1769 square kilometers, is situated between latitudes

9.07oN and 7.6oE. The tropical continental air mass is typically dry, cold, and dusty because it originates from the Sahara, whereas the tropical maritime air mass is typically warm and moist since it originates from the Atlantic Ocean (Ochei, 2015; Akinsanola and Ogunjobi, 2014). There are seasonal variations in the temperatures over FCT as a consequence of the disparities in these two air masses' properties. Six (6) area councils make up the Federal Capital Territory: Abuja Municipal, Abaji, Bwari, Gwagwalada, Kuje, and Kwali. FCT offers fertile soil for farming and a year-round climate that is neither too hot nor too cold. The FCT encounters two types of weather each year. They are the rainy season, which starts around April and lasts until October, and the dry season, which starts in October and lasts until March but is typically distinguished by bright sunshine, but with the influence of climate change, it is actually difficult to predict rain fall pattern currently. The north-east trade wind induces a brief period of harmattan during these times, which is accompanied by a dusty haze, extreme cold, and dryness. The frequent occurrence of squall lines, which are preceded by thunder storms, lightning, strong winds, and heavy rainfall, is an important aspect of this region's climate (Adejuwon, 2012; Babbie, 2014).

Research design

The sampling approach used in this study was chosen since data were only gathered once, and it is typically the most straightforward and affordable option. Similarly, Idu et al. (2018) suggested that sample research design is ideal for description reasons as well as for figuring out how variables relate to one another, and that it is time and money efficient.

Population, sampling procedure and sample size

Sampling frame includes households engaged in OFSP production in Gwagwalada Area Council. OFSP farmers were selected purposively to ascertain effectiveness of communication channels on small holder farmers' adoption of orange fleshed sweet potato (OFSP) technologies from family household's viewpoint as a unit of assessment. Due to the fact that the majority of sweet potato production activities take place in Gwagwalada, the Gwagwalada Area Council was selected for this study. Because the farmers picked were thought to be reliable sources of information and had a range of village experience to reflect farmers in the study area, a multi-stage random selection approach was employed to choose a representative sample of OFSP farmers. The Taro Yamman sample size selection method would have been ideal, however at the time of the study, the population of OFSP farmers had not been created by the relevant authorities. However, the Federal Capital Territory's Agricultural Development Programme (FCT-ADP) zoning plan, which divided the FCT into six (6) administrative zones, namely Abaji, Abuja, Bwari, Kwali, Gwagwalada, and Kuje, served as the basis for the sampling strategy for this study. The FCT-ADP zones are further stratified into twenty-six (26) blocks and 131 cells. Gwagwalada zone has four (4) blocks as shown below.
Using a multi-stage sampling approach, OFSP farmers will be chosen from the Gwagwalada ADP agricultural zone of the FCT in order to obtain a representative sample of the OFSP farming community and meet the study's objectives.

The first stage involved selection of Gwagwalada ADP agricultural zone out of six. The second stage involved the four blocks in Gwagwalada. The third stage involved a random selection of three villages from the blocks. The last stage involved a purposive random selection of ten OFSP farmers from three villages by writing the names of OFSP farmers each in a small piece of paper, folding the papers and putting them in an empty container and shaking it very well after which ten will be picked using simple random technique, resulting to a total number of one hundred and twenty respondents/farmers. This method will give no room to biases. This is how the study will arrive at a total sample size of One Hundred and Twenty (120) OFSP Farmers.

Instrument for data collection

The study obtained information on the various aspects dealing with effectiveness of communication channels and small holder farmers' adoption of orange fleshed sweet potato (OFSP) technologies by farmers. Primary data collected included socio economic characteristics of orange fleshed sweet potato farmers such as age, gender, level of production, and household etc. which were thought to be related to effectiveness of communication channels and small holder farmer's adoption of orange fleshed sweet potato (OFSP) technologies. Also, agricultural information on sources of information, farming experience were also collected. In addition, information was gathered on problems associated with channels/sources of communication with regards to adoption of OFSP technologies, and factors affecting effective communication.

Method of data collection

In the course of this study, primary and secondary data were collectively utilized. The primary data were gathered through the administration of standardized questionnaires, which were then verified by professionals from the University of Abuja's department of agricultural extension and rural sociology, as well as through individual interviews. The secondary data were gotten

from other scholars that worked on related topics, information from FCT Agricultural Development Programme, Library and Literature etc. One enumerator from Gwagwalada zone with appropriate extension skills was trained before the pilot study. Permission/introductory letter for data collection will be obtained from the Head, Department of Agricultural Extension and Rural Sociology, University of Abuja.

Validation and pilot-testing

The pilot-testing of the questionnaire will be at Dafa community, Yangoji block, Kwali Area council in which 10 (ten) OFSP farmers were interviewed; nonetheless, they weren't included in the intended sample size. The enumerator and researcher made insightful observations. It was encouraged for the enumerator to offer feedback and ideas regarding the instructions, the questions' precision, and their applicability. The questionnaire should be pilot tested to identify unnecessary and protracted items that can be reworded to improve the instrument's validity. In order to enhance the questionnaire, the respondents' remarks and recommendations were also taken into consideration. Before printing the final version of the questionnaire, ready for data collection in the field, many other modifications were made and the questionnaire was modified in the manner of pilot testing.

Data analysis

Objective one (1): to describe socio-economic characteristic of the respondents was achieved using descriptive statistics. The frequency distribution, means, and percentages were employed as the descriptive statistic tools.
Objective two (2): to examine the improved OFSP technologies adopted by farmers in the study area was employing descriptive statistics;
Objective (3): to Highlight the sources of information on adoption of technologies by Orange Fleshed sweet potato farmers in the study area was achieved using Four-point Likert scale of very high, high, medium and low.
Objective (4). to investigate the effectiveness of communication channels Used to disseminate Orange Fleshed sweet potato technologies for adoption in the study area was achieved using Four point Likert scale of very high, high, medium and low.
Definition and Measurement of Variables: A quantifiable quality that changes is referred to as a variable. It may alter throughout time depending on the group, the individual, or even the individual themselves. There are many types of variables but for the reason behind this study, dependent and independent variables were considered. Table 1 shows the frequency distribution of OFSP Farmers in the Study Area by their Socio-economic Characteristics. Table 2 presents the awareness and adoption of technologies of OFSP such as; Land preparation method, varieties adopted, Planting of OFSP cuttings of 3 - 4 inter nodes, Sources of planting materials, spacing recommended planting method, recommended storage method, recommended processing methods, utilization and recipe development were all measured by asking farmers the level of effectiveness using 4 point Likert- type scale of; Very high= 4, High = 3, Medium = 2 and Low = 1. In order to accomplish this, respondents were questioned about the level of awareness and adoption of every one of them. The mean score of respondents based on the 4-point Likert-type rating scale was computed in this way; 4+3+2+1=10. 10/4 = 2.5 cut off point. Using the limit as a guide, mean scores below 2.5 were considered as low while mean scores of 2.5 and above were considered as high.

Sources of information on technology use by orange fleshed sweet potato farmers in the study area

Sources of information on proven agricultural technology to OFSP farmers were measured. The mean score of respondents based on the 4-point Likert-type rating scale was computed in this way; 4**+**3+2+1= 10/ 4 = 2.5 cut off point. On the basis of the limit, mean scores below 2.5 were considered as low while mean scores of 2.5 and above were considered as high. The respondents were asked to indicate the level of effectiveness of communication channels or different medium of information delivery. These were measured by asking farmers the level of effectiveness using 4 point likert- type scale of; Very high= 4, High = 3, Medium = 2 and Low = 1, mean cut off point was used to determine level of effectiveness of communication channels.

RESULTS AND DISCUSSION

Socio economic characteristics of OFSP farmers in the study area

The socioeconomic traits of OFSP farmers in the research region are shown in (Table 1). According to the study's findings in (Table 1), 62.8% of the OFSP farmers in the study area were men. This indicates that in the research area, men were more actively involved in the manufacture of OFSP than women. This contradicts the assertion made by (Ndolo, et al., 2011) that sweet potato (SP) is frequently farmed and consumed by resource-poor households, with a focus on women. The outcome is in line with Mbanaso et al. (2012), who in their study on

Table 1: Socio –economic variables of the farmers.

Socioeconomic variables	Frequency	Percentages (%)
Sex		
Male	59	62.8
Female	35	37.2
Age (years)		
Below 20	2	2.1
20-30	12	12.8
31-40	16	17
41 -50	23	24.5
51-60	17	18.1
Above 60	24	25.5
Marital status		
Married	59	62.8
Single	17	18.1
Widow/widower	18	19.1
Divorced/Separated	0	0
Educational level (years)		
No formal education	6	6.4
Adult Education	9	9.6
Primary education	6	6.4
Secondary education	19	20.2
Tertiary education	54	57.4
Member of potato farmers association.		
I am a member	49	60
I am not a member	43	40
Length of membership		
No membership	37	40
Less than 5years	12	13
5-10 years	14	15
11-20 years	15	17
21years and above	14	15
Household size (Numbers)		
1-10	57	60.6
11-20	22	23.4
21-30	15	16
Problems of channels/sources of communication		
Non availability of extension agents	17	18
Non availability/poor network	66	73
Lack of knowledge of digital agriculture	9	9
Factors affecting effective communication		
Language barrier	0	0
Poverty	5	5
Non fulfilment of promises by govt.and NGOs	8	9
Non availability of extension agents	5	5
Poor internet services	32	37
No knowledge of cyber extension	38	40
No problem	4	4
Location		
Dobi	20	22
Gwagwalada	35	37
Paiko-Nkore	18	20
Zuba	21	19

the level of adoption of SP production technology by farmers in the southeast agro ecological zone of Nigeria revealed that gender distribution among farmers is somewhat skewed towards male in SP production. The involvement of more men might be because of the high cost of OFSP compared to the white fleshed variety in the

study area. In the research region, gender disparity may be seen in the resources accessible to homes with male and female heads of household. More resources are available to male-headed households than to female-headed households. Crop output, non-farm revenue, total household income, and labor hours available were all considerably greater in families headed by men than in those headed by women. In the research region, roughly 70% of agricultural production choices were made by men.

Results in (Table 1) also indicate that 62.8% (majority) of the farmers in the study area were married, 18.1% were single, 19.1% were widowed as at the time the questionnaires were being administered. This outcome is consistent with Akinbile (2010) assertion that married farmers make up the majority of SP farmers. This suggests that more couples were involved in OFSP production in the study area. The high level of couple's involvement in OFSP production may likely be as a result of high demand of labor for agronomic practices by the family to add up to the hired labour. This result is also in line with Olasunkami et al. (2012), who reported that more couples are involved in crop production.

Also in (Table 1), the results indicated that the ages of OFSP farmers in the study area were distributed as follows. 25.7% were above 60 years, 24.5%, ages 41-50 years were 24 5%, 51-60 years 18.1%, ages 31-40years 17.0%,20-30 years, 12.8%, Less than 20 years 2.1%. This is a clear indication that able bodied farmers that could handle any of the agronomic practices in OFSP production were involved in OFSP value chain in the study area. It also infers that the farmers might be able to effectively access extension services. This outcome is consistent with those of Onyegbula (2017), who found that the majority of crop farmers were between the ages of 41 and 50, still in their prime working years. From the results in Table 1, majority (93.6%) of the OFSP farmers in the study area had formal education, with 34.0% having tertiary education. The indication of this is that farmers in the study area would accept improved technology on agriculture (adoption of OFSP value chain inclusive) faster and better. This finding agrees with Idu et al.(2018) that education will improve farmers' capacity to acquire, analyze, and apply information important to the adoption of a new technology. Hence, education will boost a farmer's likelihood of using an invention. Education has long been associated with the ability to positively influence farmers' adoption of better technology (Mbanaso *et al.* 2012).

Results in Table 1 also indicate that majority 60.6% of the OFSP farmer's household in the study area were between 1-10 persons, 23.4% had 11-20 persons, 16% had 21-30 persons. The mean household size was 12, which depicts that on the average, household size of OFSP farmers was 12 persons. This is synonymous with the large household size expected for farming household. This concurs with Mbanaso et al. (2012) who stated that the typical household size was seven people. This indicates that the households of the farmers were comparatively sizable. From Table 1, majority (89.0%) of the OFSP farmers in the study area had between 3-10 years of experience in OFSP production. Experience may facilitate the understanding of OFSP production. Experience they say is the best teacher. This result implies that the respondents will be rational in acceptance and adoption of any new variety of SP. However, Chukwuji et al. (2010) argued that despite having more farming expertise, many farmers continue to use the same methods rather than experimenting with new ones, likely because they are risk-averse by nature. The result in Table 1 revealed that majority 51.2% of the respondents belonged to cooperatives, but 48.8% did not belong to cooperative. This situation could result to effective access to farm inputs because cooperative lead to pooling of resources by members. Out of the 51.2% that belonged to cooperative, 63% had been members for the past 1-8 years while 37% had been members for the past 9-26 years. Additionally, 66.67% belong to 1-2 cooperatives, 25% belong to three cooperatives and non-belong to 4 and above cooperatives. Nonetheless, this is in line with the findings of Bergh et al. (2010), who noted that 60.3% of the 63.5% of SP farmers who had financing access were members of a farmer cooperative. Gaining access to credit from a bigger resource pool is one of the main benefits of being a member of a farmer cooperative or organization, but some farmers may not be able to afford the minimal dues required to join.

Sources of information on proven agricultural technology on ofsp and the level of effectiveness in the study area

The results in (Table 2) indicated that the sources of information on proven agricultural technology and the level of effectiveness to orange fleshed sweet potato farmers in the study area. From the results, the most effective source of information on proven Agricultural technology on Orange Fleshed Sweet Potato was information communication technology ICT (97 %) according to of the respondents.

Also, 78.7 % of the respondents selected print media as the second most effective source of information. Both ICT and print media have a mean score of 3.42 and 2.96 respectively to rank 1st and 2nd most effective sources of information among the listed sources of information., fellow farmers and others all scored below the mean score of 2.5 which implies that none of them are high sources of information on proven agricultural technology on orange fleshed sweet potato.

This result agrees with the findings of Bernard and

Table 2: Sources of information. level of effectiveness of communication channels used to disseminate orange fleshed sweet potato technologies for adoption in your area the as listed.

Sources of information	Percentage (%)	Mean score (μ)	Ranking
ICT (Radio, Television, Internet, telephone)	97.0	3.42	1st
Print media (newspaper, bulletin, leaflets)	73.0	2.96	2nd
Extension agents	26.7	2.21	3rd
Fellow farmer	23.7	2.00	4th
Others	4.4	0.19	5th

Source: Computed from field survey (2023), **NOTE:** Multiple responses were allowed. 3.05- 4.00 means very high, 2.05-3.04 means high, 1.95-2.04 means moderate, 1.0-1.94 means low.

Table 3: Level of awareness and adoption of the following OFSP production technology.

Extent of satisfaction	Frequency	Percentage (%)	Mean score
Ploughing and harrowing.	69	72.9	3.0
Heap making.	65	69.2	2.86
Ridging.	57	60.8	2.6
Bush burning and zero tillage	55	58.5	1.67
Adoption of king J. variety	58	62.0	1.51
Adoption of mother's delight variety	66	69.9	3.32
Adoption of Solo-gold	45	47.9	2.76
planting of cutting of 3-4 inter nodes	70	74	3.13
plant spacing of 30 x 100cm	70	74.1	3.19
Sources of planting materials/vine			
-Decentralized vine multiplier	51	54	1.8
-Extension agent.	51	54	1.88
Agro-input dealer	32	34	1.73
-Regrowth from my farm.	70	74.1	3.23.
-other farmers	51	57	1.6
Storage using pit or underground	42	85.0	1.2
Improved processing methods	55	62.4	2.6
Utilization of recipe development	59	66.3	2.72

Note: 3.5 - 4.00 means very highly adopted (VHA), 2.5 – 3.49 highly adopted (HA), 1.5 – 2.49 means moderate adoption (MA), 1.0 – 1.49 low/No adoption (LA)

Frankwell, (2014) who opined that radio, television and newspapers were the most widely used information channel. In addition, a study by Alam and Haque (2014) conducted in Bangladesh discovered that the most agricultural knowledge was implemented as a result of television being more commonly used. Also this assertion agrees with the findings of (Nazari and Hassan, 2011) who opined that Mass media have the capacity to distribute information effectively to big audiences, the findings disagree with Chandrasekan *et al.* (2010) who opined that universities and research facilities are the primary sources of agricultural information in India. The results also disagree with the findings of Bawa *et al.* (2014) whose work revealed that 100% sources of agricultural information are through extension agents.

OFSP production technology

Level of awareness and adoption of the following production technologies

From Table 3, result indicates that majority (72.9%) of OFSP farmers were aware adopted ploughing and harrowing of the field before making of heaps or mounds or ridges to plant crops especially root and tuber crops. The means score was calculated to be 3, which is above 2.5 and within the acceptance region of high awareness and adoption so we can therefore resolve to a conclusion that majority of the OFSP farmers in the study area were aware and adopted ploughing and harrowing. These activities help to pulverize the soil very well hence encouraging tuberization and rooting of crops as the case may be. This result is consistent with research by Bergh et al. (2010) who found that tilling and plow assist develop loose soil for the best sweet potato crop performance.

In (Table 3) the results also reveal that majority (58.5%) of OFSP farmers did not adopt bush burning and zero tillage which does not encourage pulverization of the soil hence discouraging tuberization and rooting of crops as the case may be. Bush burning is also not advised because of the danger of killing useful living organisms in the soil and possibility of causing wild fire. The mean score was calculated to be 1.67 below the acceptance

region of 2.5 of adoption. Hence we can say that most OFSP farmers in the study area did not adopt zero tillage and bush burning as a good production technology for OFSP root production. Also from (Table 3), results indicated that majority of the farmers (62.0%) were not feeling content with the adoption of King J. variety. Having a mean score of 1.5 which is below 2.5 which falls within the decision rule of not low or not adopted therefore it agrees with the rule. The dissatisfaction is attributable to the fact that a larger percentage of respondent farmers who planted the variety in the study area complained that the roots cracked, which made it unmarketable. Also result in (Table 3) indicated that majority (69.9%) of the OFSP farmers in the study area highly adopted mother's delight variety with a mean score of 3.32, it shows very high adoption rate. Farmers in the study area were overwhelmed by the short gestation period, the colour of the root, the taste and its medicinal value of being a pre-cursor of pro vitamin A. (Low, *et al* 2001). Ex ante impact analysis showed that OFSP might significantly help reduce vitamin A deficiency in Sub Saharan Africa. The mean score of 3.32 agrees with the decision as shown in the (Table 3).

Also from (Table 3) also, 47.9% of the farmers adopted Solo gold variety with a mean score 2.8. results indicate that majority (74%) of OFSP farmers were aware and adopted planting of cutting of 3-4 inter nodes. The mean score of 3.13 is calculated which shows that the farmers adopted highly the planting of cutting of 3-4 inter nodes. This is in line with the findings of (Mbanaso, *et al.,* 2012) who opined that the recommended vine cuttings used for planting sweet potato are 2-5 node cuttings.

Entries in (Table 3), indicated that majority (74.1.0%) of OFSP farmers very highly adopted plant spacing of 30cm x 100cm.This is a recommended spacing by research finding; this encourages optimum utilization of the land; The mean score was calculated to be 3.19. This is above 2.5 which is the accepted mean score of satisfied therefore the respondent in the study area very highly adopted 30cm x 100cm spacing. The outcomes are consistent with those of (Mbanaso, et al., 2012), who found that for solo and intercropped systems, the ideal plant spacing on sweet potato farms is 30 cm × 100 cm on ridges and 25 cm x 100 cm on mounds.

Also result in (Table 3) indicated that majority (85.0%) of the OFSP farmers in the study area did not adopt storage of OFSP root using pit or underground. The mean score was calculated to 1.16 below 2.5 but within the acceptance region of not adopted. This is because pit storage encourages decay of the roots and weevil infestation. This agrees with the findings of (Bergh *et al.,* 2010) who stated that as sweet potatoes may be grown all year long and are easily collected in piecemeal amounts as needed, long-term storage is not a strategy that is frequently used. The crop's short storage life, dangers of sprouting, dehydration, sweet potato weevil (beetle) assaults, and black rot damage severely limit the ability to store fresh roots of sweet potatoes. The issue of storage makes the product seasonal and the industrial uses of sweet potatoes exceedingly challenging, according to (Onyeweaku et al 2010).

Also result in (Table 3) indicated that majority (62.0%) of the OFSP farmers in the study adopted processing of OFSP root into quality flour and Garri. the mean score was calculated to be 2.61 above 2.5 and within the acceptance region of high adoption; hence we say OFSP farmers in the study area adopted processing of OFSP root into quality flour and Garri because with this it commands demand at good prices; This is in line with the findings of Bergh *et al.* (2010) who opined that when mixed with maize flour and sugar, sweet potato may be used to produce garri, which are roasted dry granules that are ground into a fine flour, or it can be used to make fried snacks. Chips and other sweet potato snacks like potato crisps are becoming more and more popular, particularly in urban areas. These products provide farmers opportunities for financial gain.

From (Table 3) results indicated that majority (66.3%) of OFSP farmers highly adopted the utilization of the Roots to produce bread, juice, doughnut, chin- chin. The mean score was calculated to be 2.72 above 2.5 but within the acceptance region of high adoption hence we say OFSP farmers in the study area adopted the utilization of the Roots to produce bread, juice, doughnut, chin- chin. This is because with this, it commands demand at good prices. According to Bergh et al. (2010), sweet potatoes can be used to make garri, which are toasted dry granules that are milled into fine flour or made into fried snacks when combined with maize flour and sugar. Chips, potato crisps, and other sweet potato treats are growing in popularity, particularly in urban areas, and present income generation opportunities for farmers. Efficacy of the channels of communication utilized to spread Orange The study area's adoption of fleshed sweet potato technology was achieved utilizing a four-point Likert scale with the categories of very high, high, medium, and low.

Conclusion

The results found out that marital status, (t=8.399) membership of association, (t=15.979) contact with extension agents (t=2.078) had a positive and significant association, the study revealed that respondents were influenced by their socio-economic characteristics such as gender, age, education level, household size and extension visits on access to information and adoption of OFSP technologies. The Farmers' responses were high on adoption of mother's delight and Solo gold varieties. However, adoption of King J. was low. Information

communication Technology (ICT) had significant effect on the effectiveness of communication channels.

Recommendations

1. ICT service providers should improve on their services because most of the rural areas do not get network most times to communicate. Everything in digitalized nowadays.
2. The Orange fleshed sweet potato (OFSP) value chain should be improved upon to leverage and better the farmer's income, thereby stabilize OFSP price by NGOs, organized private sector and Government through advocacy on the importance of OFSP through radio gingles, Market shows Television programme show casing OFSP value chain.
3. Storage facilities and processing facilities should be developed and mass produced at affordable rates for stakeholders by relevant agencies such as Nigerian Federal Institute for Industrial Research (FIIRO) Oshodi Lagos and National Center for Agricultural Mechanization (NCAM) Ilorin.
4. Extension agents should be trained and equipped ICT knowledge and working tools. There should be increased budgetary allocation to ICT departments at all levels of government. Private ICT service providers are highly encouraged to invest on ICT services so that stakeholders will always see where to fall back on if public ICT fail

REFERENCES

Adejuwon S. A. (2014). Impact of climate variability and climate variability on crop yield in Nigeria. Contributed Paper to Frontiers in *Ecology and the Environment,* 7(3), 150-157.

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

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

Adwola, I. S., Okoth, P. F., Mulwa, M. R., Esilaba,A.O., Mairura, F. S. and Nambiro, E. (2012). Affecting the Adoption of Innovation at the Grassroots Level in Ogun State. *Communication Theory and Research,* 36 (1), 112-129

Akinbile, L. A. and Otitolaye, O. O. (2008). Assessment of Extension Agents' Knowledge in the Use of Communication Channels for Agricultural Information Dissemination in Ogun State, Nigeria, *Journal of Agricultural and Food Information,* 9 (4), 341-353

Akinsanola AA, Ogunjobi KO (2014). Analysis of Rainfall and Temperature Variability over Nigeria. *Global Journal Human-Social Science,* 14(3), 1-9.

Aluko K. J., Sennuga S. O. and Ezinne M. E. (2021). Exploring Smallholder Farmers' Perception on the Uptake of Agricultural Innovations in Kuje Area Council, Abuja *International Journal of Agricultural Economics.* 6 (6), 315-323.

Aphunu, A. Otoikhian, C. S. O. (2011). Farmers' perception of the effectiveness of extension agents of Delta State Agricultural Development Programme (DSADP). Ayr. Journal Gen. Agric. 4(3):165-169.

Babbie, E.R. (2014). Survey Research Methods Wadsworth. Publishing Company, California. 395pp.36.

Bawa, D.B., Ani, A. O., and Bzugu P.M.(2014). Influence of Sources of Agricultural Information on Maize Farmers in Southern Borno, Nigeria. *New Media and Mass Communication* 4 (2), 2224-3267.

Bergh, K. Orozco, P. Gugerty, M.K. and C. Leigh Anderson (2010). Nigeria Sweet Potato Value Chain Highlights EPAR Brief No. 220 36.

Chandrasekan. S., Dipesh,D.M., Jitendra, K.J.D., Kamlesh,J. S., and Dinesh, K.J.N. (2010)

Chukwuji, C. N.; Tsafe, A. G.; Sayudi, S. Yusuf, Z.; and Zakariya, J. (2018). "Awareness, Access and Utilization of Family Planning Information in Zamfara State, Nigeria". Library Philosophy and Practice (e-journal). 771.https://digitalcommons.unl.edu/libphilprac/1771

Fadiji T.O, Adebola O.A,and Kehinde E. Adeboye(2005): Social Activities and Socio – Economic status Of Rural Farmers Cultivating Improved Maize In Kaduna State *Nigeria journal of agricultural and social research (JASR)* vol.5, No 1 Pp. 13 and 14

Fadiji, T. O. and Sennuga, S. O**.** (2020). Influence of Characteristics and Perception on Usage of Information and Communication Technologies (ICTs) by Selected Extension Agents in Northern Nigeria, *Global Journal of Agricultural Research,* 8(2), 45-57.

Hartman, M.A., Nierkens, V., Cremer,S. W. (2014). Is channel communication channels, as experienced by gender and ethnic groups during

Idu, E.E, Nnaji J.N, Iheonu M.E, and P.N. Nwali. (2018) Time series analysis of adoption rate of Orange fleshed sweet potato in Kwali area council of FCT. *Journal of AESON* Pp 98-105.

Jirgi, A. J., Abdulrahman, M. and Ibrahim, F. D. (2009). Adoption of improved rice varieties among small-scale farmers in Katcha Local Government Area of Niger state,

Kreuter, M. W. and McClure, S. M. (2004). The role of culture in health communication.

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

Mbanaso, E. O., Agwu A. E., Anyanwu A. C. and Asumugha G. N. (2012). Assessment of the extent of adoption of sweet potato production technology by farmers in the southeast agro ecological zone of *Nigeria Journal of Agriculture and Social Research (JASR*) Vol. 12, No. 1.

Nazari, M. R., and Hassan, M. S. B. H. (2011). The role of television in the enhancement of Link:http://dx.doi.org/10.1080/02500160903525064 retrieved on 10/01/23.

Okwu, O. J. (2011). Characterizing Farmer Users and Nonusers of Mass Media as Channels Farmers' agricultural Information in Benue State, Nigeria, Journal of Agricultural and Food Information, 12:3-4, 315-328, DOI: 10.1080/10496505.2011.610709.Pp 323, 326.

Onasanya, A.S., Adedoyin, S.F. and Onasanya, O.A. (2006). Communication Factors, 7and21.

Onyegbula C. B. (2017). Rice farmers perception of effects of climate change on rice development stages in Niger State *Journal of Agricultural Extension and Rural Development* .9(2), 14-19

Oyewole, S. O.,and Sennuga, S. O. (2020). Factors Influencing Sustainable Agricultural Practices among Smallholder Farmers in Ogun State of Nigeria, *Asian Journal of Advances in Agricultural Research,* 14 (1), 17-24

Pritwani, R. and Mathur, P. (2015). Strategies to combat micronutrient deficiencies: A review. International Journal of Health Sciences and Research, 5 (2), 362–373.

Rogers, E.M. (2013). Communication and Development. Critical Perspectives. As age contemporary social science issue. Pp 50.

Sennuga, S. O. (2019). Use of ICT among Smallholder Farmers and Extension Workers and its Relevance to Sustainable Agricultural Practices in, A Thesis submitted for the degree of Doctor of Philosophy (PhD), Coventry University, United Kingdom.

Sennuga, S.O., Fadiji, T.O. and Thaddeus Hellen. (2020). Factors influencing adoption of improved agricultuiral technologies (IATs) among small holder farmers in Kaduna state, Nigeria. *International Journal of Agricultural education and Extension*.6(2), 358-368

Tziovaras, T. (2008). How to effectively communicate sustainability issues to politicians.

Udemezue, J. C. (2019). Profitabilities and constraints to sweet potato production in Nigeria. Current Trends in Biomedical Engineering and Biosciences, 19(2), 556007. Retrieved from https://juniperpublishers.com/ctbeb/CTBEB. MS.ID.556007.php

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

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