



ANALYSING ADOPTION OF ROOT AND TUBER EXPANSION PROGRAMME TECHNOLOGIES AMONG RURAL FARMERS IN BENUE STATE, NIGERIA

¹Afatar, S. and ²Okwoche, V.A.

¹Department of Agricultural Science Education, College of Education, Oju, Benue State, Nigeria

²Department of Agricultural Extension and Communication, College of Agricultural Economics
and Extension,

Joseph Sarwuan Tarka University, Makurdi, Benue State, Nigeria

✉Corresponding Author's email address: sekeghter5@gmail.com

Abstract

The study analysed adoption of root and tuber expansion programme technologies among rural farmers in Benue State, Nigeria. The respondents comprised all registered root and tuber crop farmers in Benue State. A sample size of 159 respondents (rural crop farmers) was selected using stratified purposive and simple random sampling techniques. Data for the study were collected from primary source only using structured questionnaire and data collected were analysed using descriptive statistics. Findings revealed that 58.5% of the respondents were aged between 41 and 60 years; 61% were males; 62% had secondary education; about 53% had farming experience of 21-30 year; 39% had root and tuber farm size of 2.01-3 hectares; 44.7% had household size of between 6 and 10 persons; 32.7% of the respondents earned ₦500,001 and above from root and tuber crops per annum, about 47% had annual off-farm income of at least ₦100,000.0 and 51.6% belonged to farmers' associations. Findings on mean score of sources of information indicated that of the respondents ($\bar{x}=3.16$) obtained information from extension workers, the extension workers practised individual visit ($\bar{x}=2.75$) in delivering information on the programme's technologies to farmers and 84.3% adopted early planting. Farmers were introduced to different technologies by the programme through various means and methods of disseminating information. Farmers obtained information about the technologies and utilised it for the benefit of increased yield. It is recommended that extension workers should employ other means of disseminating information other than individual visits.

Keywords: Adoption, root and tuber, technologies, rural, farmers

Introduction

Root and tuber crops ranked high as drought-resistant crops grown all-year-round, hence, have become important staple foods consumed in Nigeria, accounting for about 20 percent of calories consumed in the country (Scott *et al.*, 2000). For instance, annual mean per capita consumption of cassava in Nigeria is about 140 kg (Philips, 1998). Nigeria root and tuber crops are the second most important food crops, after cereals and have the potential to contribute significantly to food security (Kays and Paull, 2004). They are used to alleviate seasonal shortages and fill food gaps caused by natural or man-made disasters (Tanganik *et al.*, 1999). These crops, also, serve as raw materials in manufactured products for both rural and urban consumption in addition to providing income for resource poor farming households (Nwakor *et al.*, 2011). Given the global drive towards attainment of food security and welfare maximization, root and tuber crops have become increasingly important for household and social welfare among rural dwellers (Nwakor *et al.*, 2011).

Cassava is most often grown in association with other crops such as maize or groundnuts. The crop takes from 8 to 12 months to mature and the roots may be left in the field for months after it maturity as a form of in-ground storage. The roots are often processed prior to use or directly sold for human consumption. Sweet potato is cultivated predominantly under lowland conditions. One common system involves a variety of different rotations with rice. In this system, the crop is irrigated and harvested at maturity after four to five months. Sweet potato is increasingly cultivated for cash where both vines and roots are processed into feed or starch prior to sale (Scott *et al.*, 2000).

Yam is cultivated predominantly in the humid forest, forest/savannah transition, and the Southern Guinea Savannah (SGS) zones of West Africa with most of the current production in the SGS zones. It is grown as a sole crop or in various combinations with maize, vegetables, cassava, plantain, sorghum, or coffee. The crop matures in 7 to 12 months, depending on species and cultivar, and the tubers may be stored in fresh form for over six months under ambient conditions (Horton, 1988).

Root and Tuber Expansion Programme (RTEP) was designed by the Food and Agriculture Organization (FAO) in conjunction with the Federal Government of Nigeria following the completion of Cassava Multiplication Project (CMP) (Ugwu *et al.*, 1996). In December 1999, the International Fund for Agricultural Development (IFAD) approved a credit of 23.05 million U.S. Dollars to the Federal Government of Nigeria (FGN) for RTEP.

The main thrust of the programme was to consolidate gains made under the Cassava Multiplication Project (CMP) in order to enhance national food security and income for poor farmers.

The programme focused on available low-cost technologies that can be easily adopted by poor farmers, a combination of improved cassava, yam, sweet potatoes and cocoyam varieties, and well as also improved cultural practices. In Nigeria, majority of households are food insecure, especially the rural farming households. Several evidences have suggested that majority of the world's food insecure live and work in the rural areas (IFAD, 2001). This indicates that reducing rural food insecurity is very important to reducing overall food insecurity. Majority of farmers in the rural areas plant root and tuber crops and cassava, for instance has the ability to thrive in soil containing little nutrients. It is against this background that these crops were selected for this project.

Methodology

The study was conducted in Benue State, Nigeria. The State lies between longitude 6°35' E and 8°10' E of the Greenwich Meridian and latitude 6°30' N and 8°10' N of the equator at an elevation of 97m above sea level in southern guinea Savannah agro-ecological zone. The State covers landmass of 32,518 Km² and a population of 5,741,815 people (NPC, 2016). Benue is one of the 36 States in Nigeria; it lays in the north-central region of country and share boundaries with five other States, Nassarawa to the north, Taraba to the east, Cross-River to the south, Enugu to the south-east and Kogi to the west. The State also shares a common boundary with the Republic of Cameroon in the south-east (BNARDA, 2010).

The State experiences tropical climate with two distinct seasons, the rainy season which lasts from May to October with annual mean rainfall of 1300mm and the dry season which begins in November and ends in April. Temperature fluctuates between 23°C and 38°C in the year. The State is made up of several ethnic groups including Tiv, Idoma and Igede. Others are Jukun, Etulo, Abakpa, Akweya, Hausa, Igbo and Igala among others. Most of the people are farmers, while the inhabitants of the riverside areas engage in fishing as their primary or secondary occupation. The population of this study comprised all rural registered root and tuber crops farmers who participated in the programme in Benue State. A sample size of 159 respondents (rural crop farmers) was selected using stratified purposive and simple random sampling techniques. Data for the study were collected from primary source only using structured questionnaire. Data collected were analysed using descriptive statistics. Data

on sources of information and methods of information disseminated were collected using a four-point Likert type scale. The scores were added up to 10 and divided by 4 to obtain a mean score of 2.50. A mean score that was equal to or greater than 2.50 was regarded as high.



Source: BNARDA(2010)

Key

The study area

Figure 1:Map of Benue State Showing the Study Area

Results and Discussion

Socioeconomic characteristics of the respondents

Result in Table 1 showed that may (58.5%) of the respondents were between 41 and 60 years. This category of respondents were matured and capable of making decision themselves about adoption of practices/technologies introduced to them during the root and tuber expansion programme (RTEP). Furthermore, they were a group of people who have farms and acquired experience for some years. Age has a direct relationship with adoption of

technologies as younger people may adopt new technologies better than older farmers because old farmers are more risk averse than the younger ones. The finding is in line with that of Elias *et al.* (2013) that farming activity needs strong and healthy persons. The finding is also in line with Dlova *et al.* (2004) that age is one of the determinants of adoption; younger people are better adopters of new technologies in farming than older people.

Findings in Table 1 on sex indicated that very many (61%) of the respondents were males. This means that males were more involved in farming than females in the study area. The involvement of high proportion of males in farming activities in the area may be linked to male domination of most activities including farming. Similarly farming is a tedious job especially in the peasant farming situation where all the farming operations are done manually; males are more energetic to carry out the manual farm activities than females. The finding is in tandem with that of Arene and Anyaeji (2010) that male are generally more involved in farming than females.

Result in Table 1 depicted that very many (61.6%) of the respondents acquired secondary education. This is an indication that a reasonable proportion of the respondents were literate and could read and write. Education widens the horizon of people/farmers and makes them receptive to innovations. It also, plays an important role in adoption as farmers who are educated can search for information on root and tuber expansion programme recommended technologies/practices among other innovations online, newspapers and bulletins on their own for possible adoption. However, farmers who are not educated may rely on either extension workers or other farmers for information on innovations. The finding is in contrast to that of Omonona and Agoi (2007) that small scale farmers in Nigeria have very low level of education. The finding is in tandem with that of Dlova *et al.* (2004) that farmers in North Central Nigeria are educated and are assumed to be more successful in farming.

Results in Table 1 on farming experience revealed that many (52.8%) of the respondents had farming experience of 21-30 years. This implies that majority of the farmers had reasonable farming experience. Experience is one of the fundamental pillars of life; it helps farmers/people in guiding their behaviour and actions. Experienced farmers are people who have accumulated knowledge of farming over the years and have become very much focused in terms of carrying out farming operations including rate of fertilizer application in a hectare without asking anybody, when to apply fertilizer and the best method of application in their location among others. According to Kuwornu *et al.* (2011) an experienced farmer is

more likely to have knowledge and skills which minimizes negative effect on his or her farming practices.

Findings in Table 1 showed that a small proportion of the respondents (39%) had root and tuber farm size of 2.01-3.00ha. This implies that the respondents had fairly large farm size. The farm size of most small scale rural farmers is becoming smaller everyday due to increase in population, urbanization, construction of schools and hospitals just to mention a few. Similarly, most farmers in the study area practiced scattered settlement pattern and this and other practices have led to fragmentation of land meant for farming purposes. These practices have led to many individual farmers' portions of farmland to be less than a hectare. The finding is in line with Etwire (2013) that farm size has positive relationship with farmers involvement in certain agricultural project.

Result in Table 1 on household size revealed that some proportion of the respondents(32-50%) had household size of 6-10 persons. This implies that the respondents had a fairly large household size which may enhance availability of farm labour. In the rural area, availability of labour has a direct relationship with increase in cultivation of farmland and the corresponding yield. Many farmers like having large household size because members of the family are used as a resource on the farm. A farmer with a large household size could easily participate in an agricultural project that is labour intensive while delegating other important activities to other household members and vice versa (Etwire *et al.*, 2013).

Finding in Table 1 showed that a reasonable (32.7%) proportion of the respondents earned ₦500,001 and above from root and tuber crops per annum. The implication is that the farmers do not earn much; the low level of annual income of the farmers might have lowered their purchasing power making them vulnerable to lack of farm inputs. Similarly, this may serve as one of their limitations to adoption of root and tuber expansion programme technologies that are costly. The finding is in line with that of Okwoche and Asogwa (2012) that poor/low purchasing power is one of the characteristics of small scale farmers.

Results in Table 1 depicted that a proportion of the respondents (46.50%) had annual off-farm income of at least ₦100,000.0. Annual off-farm income is obtained from sources other than the main income of the farmer; however, the main income of the farmers was generally very low. Many peasant farmers have very low income which restricts them from expanding their farm enterprise on one hand. On another hand, a reasonable number of farmers in this category may not have resources to acquire agricultural inputs required by

farmers participating in the project and by extension to increase their production.

Results in Table 1 revealed that many (51.6%) of the respondents belonged to farmers' associations. Membership of farmers' association serves as a stepping stone for interaction among members of the same group, mobilization of resources and sharing of skills to increase farm/agricultural production. Farmers' associations can best be described as a link to acquisition of farm inputs and means of information dissemination which help farmers to increase agricultural production. Now that information is considered as a factor of production, farmers especially those that are not educated stand to benefit a lot from been a member of such associations. Farmers should be encouraged to join cooperatives/associations to enable them obtain maximum benefits from such organizations. The finding corroborates that of Jayasingh and Eze (2010) that membership of farmers association is key to increase food production and by extension improve standard of living.

Sources of information on technologies promoted by root and tuber expansion programme

Results in Table 2 depicted the means score of sources of information the respondents frequently used to obtain information on technologies promoted by root and tuber expansion programme. Sources like extension workers ($\bar{x}= 3.16$) and friends, neighbour and relatives ($\bar{x}= 2.55$) were some of the major sources of obtaining information on root and tuber expansion programme technologies frequently. These variables had a mean score more than the cut-off mean score of 2.50. This means that the respondents mostly obtained information from extension workers followed by friends, neighbour and relatives. The implication is that root and tuber expansion programme was relatively new and as such most of the information was disseminated by extension workers. The information disseminated by extension agents may further be shared and discussed among farmers and through cooperative societies. The finding is in agreement with Yahaya and Aina (2007) that most farmers accessed information on improved agricultural practices from extension agents.

Table 1: Socio-economic Characteristics of the Respondents (n=159)

Variable	Frequency	Percentage	Mean
Age (years)			
21 – 40	49	30.8	
41 – 60	93	58.5	47.25
61 and above	17	10.7	
Total	159	100	
Sex			
Female	62	39.0	
Male	97	61.0	
Total	159	100	
Level of education (years)			
Non-formal education	4	2.5	
Primary education	11	6.9	
Secondary education	98	61.6	13.90
Tertiary education	46	28.9	
Total	159	100	
Farming experience (Years)			
= 10	15	9.4	
11 – 20	31	19.5	
21 – 30	84	52.8	15.31
31 and above	29	18.2	
Total	159	100	
Root and tuber farm size (ha)			
= 1.00	26	16.4	
1.01 - 2.00	32	20.1	
2.01 - 3.00	62	39.0	2.28
3.01 and above	39	24.5	
Total	159	100	
Household size			
= 5	34	21.4	
6 – 10	71	44.7	
11 – 15	19	11.9	10
16 and above	35	22.0	
Total	159	100	
Annual farm income (?)			
= 100000	42	26.4	
100001 – 300000	39	24.5	
300001 – 500000	26	16.4	411, 349.06
500001 and above	52	32.7	
Total	159	100	
Annual off-farm income (?)			
= 100000	74	46.5	
100001 – 300000	26	16.4	
300001 – 500000	10	6.3	459, 739.87
500001 and above	49	30.8	
Total	159	100	
Membership of farmer's association			
No	77	48.4	
Yes	82	51.6	
Total	159	100	

Table 2: Mean Scores of Sources of Information on Technologies Promoted by Root and Tuber Expansion Programme (n=159)

Source of information	Mean (??)	Std. Deviation
Extension workers	3.16	1.047
Friends, neighbour and relatives	2.55	0.877
Cooperative societies	2.54	0.953
Radio	2.40	0.981
Television	2.24	0.997
Use of internet	2.12	0.937

Cut-off mean = 2.50

Std. = Standard

Methods dissemination of information on technologies introduced by root and tuber expansion programme

Findings in Table 3 indicated that individual visit (\bar{x} = 2.75) had the highest mean score followed by demonstration (\bar{x} = 2.60) and the broadcast media (\bar{x} = 2.57) among others. This means that individual visits, the broadcast media and demonstration were methods mostly used for obtaining information on technologies introduced by RTEP to the respondents in the study area. Individual visit is one of the very effective methods of disseminating information to farmers. In individual visit, a farmer has the opportunity to interact with the extension agent one-on-one, though the method consumes a lot of resources and time. However, the extension worker pays more attention to issues raised by the farmer and the farmer is more informed about the intended practice than the use of other methods like meeting and mass media.

The implication is that RTEP was farmer-centred project which made use of farmer-centred methods for information dissemination that facilitated the adoption of the intended technologies to improve yield of the respondents. The finding is in contrast to that of Yahaya (2002) that mobile phone was the main point of access for information impoverished communities across the world; almost all farmers have mobile phone which is used for receiving short message services (SMS) which can be used to provide farmers with agricultural innovations information and techniques necessary to improve productivity.

Table 3: Mean Scores Based on Methods Dissemination of Information on Technologies Introduced by Root and Tuber Expansion Programme using different Methods (n=159)

Method used	Mean (?)	Std. Deviation
Individual visit	2.75	.849
Demonstration	2.60	.812
The broadcast media	2.57	.846
Public meetings	2.50	.848
Social media	2.24	1.003
Others (the print media, NGOs, neighbours)	1.08	.309

Cut-off mean = 2.50

Std. = Standard

Technologies adopted by the respondents

Result in Table 4 revealed that most of the respondents (84.3%) adopted early planting, other technologies adopted were rate of fertilizer application (79.9%) and use of improve method of planting (78.6%) among others. Early planting is very important as many farmers who practiced it over the year have resolved not to plant late. Early plant allows crops to be grown and produce before the emergence of high population of insect/pests and other diseases infestation that may affect the crops negatively and reduce the yield. Similarly, early planting has the advantage that the planted crop may be harvested early and turned out for sale at good market price. This confirms the finding of Yahaya (2002) that technologies introduced to farmers during RTEP included plant spacing early harvesting and planting depth all designed to improve farmers' yield.

Table 4: Distribution of the Respondents by Root and Tuber Expansion Programme Technologies Adopted (n=159)

Technology introduced	Frequency*	Percentage*
Early planting	134	84.3
Rate of fertilizer application	127	79.9
Improved methods of planting	125	78.6
Plant spacing	124	78.0
Early harvesting	122	76.7
Planting depth	102	64.2
Use of improved planting materials	94	59.1

* Multiple responses

Conclusion and recommendations

Root and tuber are crops that produce a variety of food which can help solve the problem of food insecurity; they, also, serve farmers in many ways including being processed to food in different forms. The introduction of root and tuber expansion programme technologies was to improve farmers' production using crops that can grow with minimum soil fertility. The introduction of root and tuber expansion programme technologies to farmers brought a lot of relief to many farmers as some of them had cultivated these crops for many years without having adequate yield and knowledge of the crops by the way of production, harvesting, processing, storage and marketing which the programme concentrated on. Farmers were introduced to different technologies by the programme through various means and methods of disseminating information. Farmers obtained information about the technologies and utilised them for the benefit of increased yield. It is recommended that extension workers should employ other means of disseminating other than individual visits.

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