Original Research Article

Adoption of Yam *(Discorea* spp.) Minisett Technology in Delta State, Nigeria

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Abstract

Yam minisett technology provides seed yams rapidly. It is designed to alleviate the problem of seed yams scarcity, which has been identified as a major constraint to increased yam production. This study examined the adoption of the technology by farmers in Delta State, Nigeria. A random sampling technique was employed in the selection of respondents. A sample size of 240 yam farmers participated in the study. Data were collected through the use of structured interview schedule. Both descriptive and inferential statistics were used in analyzing data generated by the study. Results of the study reveal that respondents had moderate awareness of yam minisett technology with an overall awareness percentage of 46%. The study also found an overall mean adoption score of 2.24, which indicates a general low adoption of the technology by the farmers. Application of minisett dust with adoption score of 2.05 was the least adopted yam minisett technology item, while cutting into minisett was the most adopted with adoption score of 2.79. The study found a significant relationship between some farmers' socioeconomic characteristics and adoption of yam minisett technology. Recommendations of the study include that more awareness on the technology should be created among the farmers by the relevant agency through the use of extension campaigns, demonstrations and small plot adoption trials (SPAT). Also, farm credit should be granted to yam farmers through the State Government's Micro Credit Scheme (SGMCS) to enhance their adoption of the technology.

Keywords: Adoption; awareness; yam minisett technology, *Discorea* spp., Delta State, Nigeria.

INTRODUCTION

Yam (*Discorea* spp.) constitutes a major staple in Nigeria. It represents about 20% of the daily calorie intake (Iwueke et al. 1991). Nigeria cultivates about 69% of the world's total acreage with yam (Onwueme, 1978), and contributes some 70% of global harvest (IITA, 1990).

According to Awa (1990), there has been a general decline in yam production in Nigeria in terms of the area under yam cultivation and total yam output at a compound rate of 1.83% and 1.49% per annum, respectively, over the years. This decline in yam production can be attributed to laborious cultivation methods, the need for staking and high cost of scarce seed yams, which are also needed for consumption. This encourages the competition between edible tubers and tuber used as planting materials (Madukwe et al., 2000).

A major constraint to increased yam production in Nigeria is therefore the lack of seed yams. Okorji and Obiechina (1993) noted that seed yam contributes about 62% of total outlay in yam production. In order to alleviate the problems of scarcity and high cost of seed yams, the National Root Crop Research Institute (NRCRI), Umudike, Nigeria, developed a new technology called yam minisett technology, which provides seed yams rapidly. The technology has been disseminated to farmers in Nigeria through the Agricultural Development Programme (ADP), the agency responsible for agriculture extension services in Nigeria.

Essentially, the yam minisett technology involves cutting of yam tubers to produce as many minisetts as possible each weighing 25 g and about 2 cm thick with some portion of the cuticle (back) attached. The minisetts are then used to produce seed yams, which will be used to produce ware yams for consumption and industrial use.

Madukwe et al. (2000) identified activities in yam minisett technology to include the following nine technology items:

I. **size of tuber for cutting:** select healthy tubers without bruises. Use yam tubers of 20-25 cm length and 25 cm girth (500-750 g). Avoid tubers with bigger girth;
II. **cutting into minisett:** cut each of the yam tubers into horizontal sections (discs), 2 cm thick. Secondly, vertically cut each 2 cm thick disc into 2, 3 or 4 pieces such that each minisett weighs 25-30 g;
III. **air drying:** allow an interval of 4-5 minutes for ambient air to reduce mucilage on the cut surface to avoid the sett from absorbing the minisett dust;
IV. **application of minisett dust or insecticides**: put the minisetts into a container with lid or in a polythene bag. Add the ministett dust (Apron plus or Fernasan D insecticides – one packet of minisett dust, 10 g, is enough for 200 minisetts) and shake the container to ensure that the minisetts are evenly dusted;
V. **curing:** spread the minisetts on a dry floor and plant a day later to allow curing of the cut surfaces;

VI. **spacing:** plant minisett at a distance of 25 cm apart on one-metre ridges or beds. This gives 40,000 stands per hectare;

VII. **planting depth:** open the soil up to 9 cm deep, drop a minisett and cover it, shallow planting leads to setts drying out or being exposed by rain;

VIII. **time of planting:** plant a day after rain as rains becomes regular (May/June).

IX. **intercropping:** plant yam 25 cm on the crest of the ridge. Mark out 12.5 cm before the first stand. Plant maize 1 m apart on two sides of alternate furrows. Mark out 50 cm before the first stand.

Yam minisett technology leads to increased yield, weed suppression due to reduced spacing and increased plant population. By using a 25 g minisett at a density of 40,000 stands per hectare, one tonne of planting material could produce 13.6 tons of seed yams per hectare. This is four times the yield obtained from the normal practice. Despite this obvious advantages of the minisett technology, seed yam scarcity still persist in different farming communities across the country. It is in view of fact, that this study was designed to examine the utilization of the technology by farmers in Delta State, Nigeria. The specific objectives of the study are to: (a) describe the socioeconomic characteristics of the farmers; (b) ascertain farmers' awareness of yam minisett technology; (c) determine the farmers' level of adoption of yam minisett technology and (d) determine the relationship between farmers' socioeconomic characteristics and adoption.

MATRIALS AND METHODS

The study was carried out in Delta State, Nigeria. The state lies roughly between longitudes $5^0$00 and $6^0$45 east and latitude $5^0$00 and $6^0$30' north. The state is generally low – lying without remarkable hills. It has a wide coastal belt interlaced with rivulets and streams, which form part of the Niger-Delta. The state occupies an area of 16,842 km^2 and has a population of 4,098,391 persons (National Population Commission, 2006).

Delta State has an average annual rainfall of 266.5 cm in the coastal areas and 190.5 cm in the northern fringes. The temperature is high, ranging between 28 ^{0}C and 34 ^{0}C with an average temperature of 30 ^{0}C. The state is blessed with fertile soils and favourable climate which makes it an important producer of food and cash crops. The State produces rubber oil palm, yams, cassava, maize, rice, plantains and citrus amongst others for local consumption and for export.

The state is divided into 3 agricultural zones, namely: Delta North, Delta Central and Delta South. Delta North Agricultural Zone was purposively selected for this study because of its prominence in yam production. The zone is made up of nine Local Government Areas (LGAs). These are Ika North-east, Ukwuani, Ika South, Oshimili North, Ndokwa East, Oshimili South, Aniocha North, Ndokwa West and Aniocha South. Three of these LGAs that are notable for production of yam were purposively selected for data collection. These are Ika South, Oshimili North and Ika North-east.

From each of the three selected LGAs, four major yam producing communities were selected. From each of the selected communities, 20 yam farmers in contact with extension were randomly selected using lists of farmers provided by extension agents covering the communities. This sampling procedure gave rise to 240 farmers that served as respondents of the study. Structured interview schedule was used for data collection. Content validation of the research instrument was carried out. The instrument was pilot tested before administration to test for reliability.

Awareness and adoption of yam minisett technology were determined by requesting each respondent to indicate his/her stage of adoption of each technology item using the 5-step adoption model of: awareness, interest, evaluation, trial and adoption. Values 1, 2, 3, 4 and 5 were assigned to the stages, respectively. The response for each technology items was then computed from which awareness percentage and adoption scores were obtained. The mid-point of the response values, which is 3.00, was taken as the cut-off point. Thus, adoption scores of 3.00 and above were regarded as high, while adoption scores below 3.00 were considered to be low. Farmers' awareness of was categories into 3 as follows: low awareness (for items with 0 – 39%), moderate awareness (for items with 40 – 69%); and high awareness (for items with 70 – 100%).

Descriptive and inferential statistics were used to analyse data generated by the study. Descriptive statistics such as frequency count, means scores and percentage were used to summarize data, while chi-square was used to determine the relationship between farmers' socioeconomic characteristics and adoption.

RESULTS AND DISCUSSION

Socioeconomic characteristics of respondents

Data in Table 1 reveal that 74% of the respondents were males, and 26% were females. Respondents' age ranged between 20 and 69 years, with a mean age of 44 years. Majority of the respondents representing 82% were married, 18% were single.

Entries in Table 1 further show that 87% of the respondents had formal education ranging between

Table1: Distribution of respondents according to their socioeconomic characteristics

Socioeconomic Characteristics	Frequency	Percentage	Mean
Gender	178	24	
Male	62	26	
Female			
Age (Years)			
20 – 29	20	8	
30 – 39	48	20	44 years
40 – 49	115	48	
50 – 59	52	22	
60 – 69	5	2	
Marital status			
Married	198	82	
Single	42	18	
Educational status			
No formal education	32	13	
Primary education	126	53	
Secondary education	74	31	
Tertiary education	8	3	
Farm size (hectares)			
0.5 – 1.5	54	23	
1.6 – 2.5	41	17	
2.6 – 3.5	96	40	2.7 ha
3.6 – 4.5	37	15	
4.6 – 5.5	9	4	
5.6 – 6.5	3	1	
Farming experience (years)			
1 – 5	44	19	
6 – 10	68	28	
11 – 15	92	38	11 years
16 – 20	27	11	
21 – 25	9	4	

primary and tertiary education. This is an indication that the respondents were literate. Formal education and literacy are believed to enhance acceptance of agricultural innovations. Respondents' farming experience was found to range between 1 and 25 years, with a mean farming experience of 11 years. This indicates that majority of the respondents have been cultivating yams for a long time. A mean farm size of 2.7 ha was found for the respondents. This indicates that majority of them are small-scale farmers.

Respondents' awareness of yam minisett technology

Entries in Table 2 show respondents' awareness of yam minisett technology. Results reveal that respondents' awareness percentage for the various yam minisett technology items ranged between 42.9% and 49%, with an overall awareness percentage of 46%. This is an indication that the respondents had a moderate awareness regarding yam minisett technology.

Respondents' adoption of yam minisett technology

Entries in Table 3 show the adoption of yam minisett technology by respondents of the study. Results show that adoption scores for the different technology items ranged between 2.05 and 2.79, with an overall adoption score of 2.24. This is an indication of low adoption.

The technology items and their adoption scores are as follows: cutting into minisett (2.79); spacing (2.15); intercropping (2.31); curing (2.25); size of tuber for cutting (2.23); time of planting (2.14); planting depth (2.11); air drying (2.09) and application of minisett dust (2.05).

A cursory look at the adoption scores reveals that application of minisett dust was the least adopted, followed by air drying, while cutting into minisett was the most adopted followed by intercropping. These findings were obviously based on some of the reasons given by respondents for non-adoption or rejection of some of the yam minisett technology items. For instance, they complained about the unavailability of minisett dust, high cost of dust and the harmful nature of dust. They also noted that air drying was not necessary.

The adoption of cutting into minisett by most of the farmers could be a result of the fact that it was easier for them

Table 2: Percentage distribution of respondents according to their awareness of yam minisett technology

Technology item	Aware Frequency	%	Unaware Frequency	%
Size of tuber for cutting	110	45.8	130	54.8
Cutting into minisett	104	43.3	136	56.7
Air drying	106	44.2	134	55.8
Application of minisett dust	116	48.3	124	51.7
Curing	110	45.8	130	54.2
Spacing	118	49.2	122	50.8
Planting depth	110	45.8	130	54.2
Time of planting	108	45.0	132	55.0
Intercropping	103	42.9	137	57.1
Overall awareness percentage		45.6		54.4

Table 3: Distribution of respondents according to their adoption of yam minisett technology

Technology Items	Adoption stages					
	Awareness	Interest	Evaluation	Trial	Adoption	Mean Adoption Score
Size of tuber for cutting	110(110)	46(92)	30(90)	26(104)	28(140)	2.23
Cutting into minisett	104(104)	18(36)	14(42)	32(128)	72(360)	2.79
Air drying	106(106)	57(114)	36(108)	30(120)	11(55)	2.09
Application of minisett dust	116(116)	42(84)	28(84)	23(92)	31(155)	2.05
Curing	110(110)	46(92)	25(75)	22(88)	37(185)	2.29
Spacing	118(118)	36(72)	38(114)	28(112)	20(100)	2.15
Planting depth	110(110)	56(112)	31(93)	24(96)	19(95)	2.11
Time of planting	108(108)	48(96)	42(126)	26(104)	16(80)	2.14
Intercropping	103(103)	35(70)	47(141)	34(136)	21(105)	2.31
Overall mean adoption score					=	2.24

Figures in parentheses are scores

Table 4: Chi-square analysis showing the relationship between farmers' socioeconomic characteristics and adoption of yam minisett technology

Socioeconomic Characteristics	Value	DF	P-Value	Decision
Gender	67.5	1	3.84	S
Age	90.8	4	9.49	S
Marital Status	231.4	4	9.49	S
Educational status	31.0	4	9.49	S
Farm size	33.3	4	9.49	S
Farming experience	87.8	2	5.99	S

Key: S = Significant ($P \leq 0.50$)

to cut tubers into minisett sizes even though the minisett may not weigh up to the recommended 25 g. Intercropping yam with maize was a regular practice in the locality hence most of them practiced intercropping that involved yam/maize or yam/cassava/maize. It was, however, observed that the majority of farmers do not adhere to the recommended intercrop spacing.

Relationship between farmers' socioeconomic characteristics and adoption

Data in Table 4 show the relationship between farmers' socioeconomic characteristics and adoption of yam minisett technology. Results reveal that there were significant relationships between gender, age, marital status, educational status, farm size, farming experience and adoption. This implies that these characteristics of the farmer could influence his/her adoption of yam minisett technology. This finding is similar to that of Iwueke (1989) who reported a significantly positive association between adoption of yam minisett technology and farmers' educational status, farm size, and contact with extension. Other studies that found relationships between farmers' socioeconomic characteristics and adoption of yam minisett technology include: Iloka and Odurukwe (1990); Chukwendu; Chinaka; and Omotayo (1994); Udo, Idio, Umoh and Robson (2008); and Nnadi and Akwiwu (2007).

CONLUSION

The study examined the adoption of yam minisett technology by farmers in Delta State, Nigeria. Results show that respondents had a moderate awareness regarding yam minisett technology. Respondents' adoption of the technology was generally low with a mean adoption score of 2.24. The least adopted yam minisett technology item was the application of minisett dust, while cutting into minisett was the most adopted. Significant relationship was found between some farmers' socioeconomic characteristics and adoption of yam minisett technology. Specifically, gender, age, educational status, farm size, marital status and farming experience were found to significantly influence the adoption of the technology.

Based on these findings, the study recommends the following: (a) Delta State Agricultural Development Programme (DTADP), the agency charged with agricultural extension services in the state should create more awareness about yam minisett technology items among the farmers. This can be done through extension campaigns, demonstrations and small plot adoption trial: and (b) the government of Delta

State should grant credit facilities to yam farmers through the states micro credit programme to hence their adoption of the technology.

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