

An evaluation of farmers' adoption of yam minisett technology in Agricultural Zone 3, Rivers State, Nigeria

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ABSTRACT: The study investigated farmers' adoption of yam minisett technology in Agricultural Zone 3, Rivers State, Nigeria. The objectives of the study were to examine farmers' level of awareness of yam minisett technology in the study area, to access the extent of adoption of yam minisett production technique in the study area, examine the constraints to adoption of yam minisett technology in the study area and to determine the influence of yam minisett utilization on the yield of yam in the study area. The study adopted a survey research design. A sample of 360 farmers was selected using random sampling technique. Structured questionnaire was used for data collection. Frequency, percentages, mean and standard deviation were used to analyze and realize the objectives of the study. The findings of the study reveal that farmers in the study area had low awareness level about the yam minisett technology and adoption of the yam minisett technology. Cost of innovations, lack of technical efficiency and low sprouting rate of minisett, poor extension delivery service and the top-down extension approach which does not take cognizance of farmers-identified production problems, lack of youth participation and involvement in farming (yam production) as a result of search for white-collar jobs, socio-economic characteristics such as educational level or background, and lack of land to commercially produce in quantity, among others are constraints to the adoption of yam minisett technology in the study area. It was recommended that the farmers should be encouraged to engage in training and to seek financial assistance in order to overcome the problem of scarcity and high cost of inputs.

Keywords: Adoption, awareness, minisett, technology, yam.

INTRODUCTION

Yam (*Discorea Spp*) is an important tuber crop in Nigeria where it is produced as food and source of income (Asumugha et al., 2009). Yam is regarded as a socio-cultural crop that is becoming expensive in urban areas as production fails to keep pace with population growth leading to demand exceeding supply (Adesoji, and Aratunde, 2012). Although Nigeria is the world's largest producer of yams with an annual production of 27 million tonnes, constituting about 65% of world's annual production (Adesoji and Aratunde, 2012), its potentials in yam production is yet to be optimized. It has been observed that yam production in Nigeria is declining substantially due to many factors, especially cost of planting inputs and labour, which account for about 50% and 40% of the cost of production respectively (Okoro, 2008). Yam is a staple food

in many African and Asian countries. It is significant in many ways in Africa, and so is it also in Nigeria. Yam is used for food in a variety of ways, such as being boiled and eaten with stew or palm oil, fried, pounded into meal (*fufu*) and eaten with soup, roasted and eaten with palm oil, grated and fried into balls, processed into flour, etc. In addition, yam has strong social and traditional values. It features prominently in traditional marriage, naming ceremonies, traditional festivals. It plays an important role in traditional religion. In some communities in South south and South east, Nigeria, it is associated with a deity, Njoku or Ajoku (god of yam); and the yam festival is celebrated in honour of this deity. It is equally used in many traditional rituals and sacrifices.

The adoption of improved agricultural technology or

innovations is a means of improving farmers' yield but the low rate of the adoption of extension packages by farmers in Nigeria has been an obstacle to the realization of this goal (Amakom, 2013). Scholars like Tasié and Nale (2020), Ajieh (2012) and Agbarevo, (2007) have shown that adoption of such agricultural extension technologies by farmers is low. Low adoption of agricultural technologies had been attributed to a number of reasons including the cost of adopting the innovation or technology. Considering the facts that the rural farmers are poor, they are not always able to purchase improved technological packages from research and extension workers. Agbarevo (2007) observed that low adoption should not always be attributed to unwillingness of farmers to adopt innovations but rather high cost of innovations. Moreover, the resource-poor farmers are unwilling to risk their small capital when the benefits expected from adoption have not been well demonstrated. Although adoption of improved technologies significantly affects tuber yield of crops (Ayoola, 2012), this would have to be well demonstrated in comparison with local varieties before farmers will adopt the improved varieties.

Seed yams are the most important inputs required for yam production in Nigeria but they are scarce and costly during planting season. One of the ways of improving present level of yam production tremendously is through adoption of the yam mini-sett technology developed by National Root Crops Research Institute, Umudike, Abia State, Nigeria. Beintema and Stads (2011) observed that the mini-sett technology stands out as the most promising in multiplication of yam setts as it is a better alternative to the traditional practice of milking to produce seed yams for planting. Milking is a traditional alternative to the mini-sett technique. Milking involves harvesting yams before full maturity (this is done usually between June and September), making sure that the feeding roots are not destroyed. The feeding roots are then covered with earth, and the plant is left for about three to four months before harvesting, (which would be in November/December) when the leaves wither. The process leads to the production of 3-6 small tubers suitable for seed yams.

The mini-sett technique addresses one of the major problems of yam production, which is the availability and cost of quality seed yams or planting setts. Planting setts account for up to 50% of the total cost of yam production, while labour accounts for about 40%, and about 20 to 30% of the farmer's harvest is retained for the next planting season (Okoro, 2008). Hence, there is competition between quantity of harvest to be consumed and quantity to be reserved for planting in the next cropping season. Moreover, sometimes, most of the yam setts reserved for planting might be infected, and become prone to decay. When planting is done with infected and less vigorous materials, poor yield would be the result, which in turn results in less profit for the farmer.

The yam mini-sett technique involves selection of clean and healthy tubers of about 500 to 1000 grams, cut into

rings of about 2 to 5 cm long and cut further into bits of about 25 to 60 g containing the periderm and some cortex parenchyma. The yam minisetts are then treated with yam mini-sett dust, or dipped into a cocktail of fungicide and pesticide (100 mg mancozeb, 70 ml Basudin, and 10 liters of water) for about 5 to 10 minutes after which the setts are spread to dry for planting the following day (IITA, 2010). The planted mini-setts when harvested provide planting yam-setts for the next planting season, which in turn produce ware yams. The technique saves the farmer the trouble of providing planting setts so that ware yams could be consumed, or sold. Yam production in Africa is constrained by several factors including the limited availability and loss of planting material as well as the high cost of labour for operations such as land preparation, staking, weeding, harvesting and storage. Due to the problem posed by availability of planting materials, efforts have been made for cheaper alternatives; one of which is the production of seed yam through the vine cutting technology (Daneji, 2011). The technology requires the use of synthesized auxins, which make adoption of the vine cutting technique by farmers in developing countries, such as Nigeria, difficult (Madukwe, 2011).

According to Igwilo (2003), yam setts can be multiplied into millions through yam propagator organs which substantially increase the volume of planting materials thus increasing the quantity of the crops harvested. It is possible to cut yam tubers into smaller fragments, or minisetts and thereby increase the coefficient of multiplication. In this case, there are often multiplication stages of 4 to 6 months in a nursery before the small tubers produced by the minisetts are transplanted. In some cases, the minisetts or slices can be sown directly in the field though the yield may be low due to ungerminated setts or uneven germination. Considerable progress has been made in the development of rapid production of seed yam by minisetts. Manyong (2000) developed the use of carbonized rice husk in inducing sprouting in freshly cut seed yam for rapid production. Minisetts are often planted on ridges or mound depending on the choice of the farmers and at a spacing of 25 cm apart. A layer of moist sawdust of 2.3 cm thick is spread on beds followed by the sowing of minisetts. Enough water is applied at intervals to keep the sawdust moist. Minisetts sprout in 3 to 4 weeks and transplanting is done when rain stabilizes in April to May. Transplanting should be in well prepared drain fields with good fertility level. Planting distance is 30 to 45 cm apart on low ridges preferably.

Prior to the discovery of oil in commercial quantity in 1951, agriculture was the primary occupation of the people of Rivers State. Rivers State is one of the leading states in the production of yam, cassava, cocoyam, maize, rice and beans. Causes of the low agricultural productivity in Rivers State, include; deteriorating resource base of the farmer vis-a-vis astronomical price increases in basic agricultural inputs, natural hazards for example drought and bush fires, the inappropriateness of some agricultural technologies

delivered, or even poor linkages between the users of the technologies - the farmers and extension services – whose responsibility it is to disseminate knowledge to farmers for improving productivity.

Okoro et al. (2013) indicated that institutionalised agricultural research and extension have not had beneficial impact on the millions of small farmers in Africa as has been expected. Okoro et al. (2013) further stated that yields of basic staples have stagnated, and the natural resource base progressively deteriorates under increasing pressure of population growth. To ensure food security in Nigeria and Rivers State in particular, there is the need for more intensive and technologically advanced agricultural production. This calls for effective collaborative linkage between farmers on the one hand, and extension and research on the other, in the development, transfer and application of appropriate agricultural technologies.

In recent years, both research and extension have intensified efforts in developing effective linkages with their target group, the farmer. The national agricultural research systems have embarked upon on-farm, client-oriented research efforts with the goal of producing technologies that are relevant for resource-poor farmers operating in various agro-ecological zones.

However, feedback mechanisms in technology development and transfer in some cases leave much to be desired. Okoro et al. (2013) observed that the feedback from extension agents and farmers is significant to the relevance of future technologies but that this is often weak. This sometimes accounts for inappropriate technologies being developed by research and promoted by extension resulting in low adoption of these technologies.

An area of major concern to this researcher is the yam minisett technology that has been developed and introduced to improve upon the efficiency of seed-yam production by farmers. Rivers State is majorly populated with farmers and rich in diverse cultural celebrations. During these festival celebrations, yams and other food items are usually eaten by the people of Rivers State. Apart from festivals, people residing within Rivers State eat yam on daily basis which are imported from other States– yet the State is an agricultural State. Based on the above background, therefore, this study seeks to provide answers to the following research questions: What is the level of awareness of yam minisett production technology among rural farmers in the study area? To what extent do rural farmers adopt the yam minisett production technology in the study area? What are the constraints to adoption of yam minisett technology? To what extent does yam minisett technology utilization influence the yield of yam?

METHODOLOGY

Rivers State agricultural zone 3 is the study area. The zone is predominantly known for agricultural activities. The zone is made up of seven Local Government Areas namely Ikwere, Emohua, Ahoada- East, Ahoada – West, Ogba/

Egbema/Ndoni, Omuma and Etche. The survey research design was used in conducting this study. A multistage sampling technique was used. In stage one; all the Agricultural Development Programme (ADP) contact yam farmers in zone 3, Rivers State were identified. The list of these farmers forms the sampling frame. For stage two, three Local Government Areas from this agricultural zone 3 were randomly selected. For stage three, four communities were randomly selected from the communities that make up each of the three Local Government Areas, making up twelve communities in all, which were used in the study. In the fourth stage, thirty farmers each from the communities were randomly selected. A total of three hundred and sixty farmers were used for the study.

Data was collected using questionnaire and analysed using descriptive statistics (frequency, percentage, means and standard deviation). The mean was obtained by the summation of all responses as assigned to a rating scale in an item divided by the total number of responses. The decision rule was based on the criterion mean score of 2.50 and above which is the benchmark for acceptance, while any item with a mean score below 2.50 was rejected.

RESULTS AND DISCUSSIONS

Level of awareness of yam minisett production technology among farmers in Rivers State Agricultural Zone 3

The data presented in Table 1 shows the level of awareness of yam minisett production technology among rural farmers in the sampled area. Items 1 and 2 were rejected which implies that rural farmers are not aware of the minisett production technology neither can they cut into small pieces that contains skin or periderm of about 25 to 30 gm. Technical messages on yam minisett production are usually not brought and taught to farmers by extension agents. Items 3, 4 and 5 were accepted accordingly with average mean of 2.74, 3.34 and 2.74 respectively which is above the cut-off point of 2.50 as criteria for acceptance and rejection. This implies that rural farmers in the sampled area are familiar with the preparation of nursery, aware of the sources of new varieties and feel the yam minisett production technology is superior to the traditional method of seed yam production despite all odds. The implication of this result is that if yam farmers are well taught about the minisett technology through method and result demonstrations, it would reduce the adoption period and increase the chances of yam minisett adoption. This result is in line with the findings of Ajieh (2012), who discovered that yam farmers in Delta State had moderate awareness (46%) of yam minisett technology.

The extent of farmers' adoption of yam minisett production technology in Rivers State Agricultural Zone 3

Table 2 shows the extent of adoption of yam minisett production technology by yam farmers. Items 6 and 7 were

Table 1. Level of awareness of yam minisett production technology in Rivers State Agricultural Zone 3.

S/N	Items	Farmers				
		Freq.	%	(\bar{x})	SD	Remark
1	Farmers in your area are very aware of the minisett production technology and can cut into small pieces setts that contain skin or periderm of about 25-30gm	178	49.4	2.47	1.02	Rejected
2	Technical messages on yam minisett production are usually brought and taught to farmers by Extension Agents in your area and the yam farmers are now conversant with the minisett technology production as they attend workshop/seminars	170	47.2	2.45	1.01	Rejected
3	Rural Farmers in your area are familiar with preparation of nursery for minisetts, how to stimulate sprouting of yam minisetts; measure the spacing distance between each setts on a ridge and learned the correct way to insert yam minisetts in planting holes	201	55.8	2.74	1.09	Accepted
4	Farmers in your area are aware of the sources of new varieties of yam minisetts from the extension agents during planting period	320	88.9	3.34	1.84	Accepted
5	Do you feel the yam minisett production technology is superior to the traditional method of seed yam production despite all odds?	301	83.6	2.74	1.17	Accepted
Grand Mean/SD				2.74	1.22	

Table 2. Extent of farmers in Rivers State Agricultural Zone 3 adoption of yam minisett production technology.

S/N	Items	Farmers				
		Freq.	%	(\bar{x})	SD	Remark
6	Farmers in your area can sow yam minisett directly into the ridges and use the technology to produce seed yams that have the characteristics of good seed yam.	310	86.1	3.03	1.12	Accepted
7	Yam Minisett Technology seems simple for farmers to apply in your area to commercially produce yam	296	82.2	2.66	1.16	Accepted
8	Majority of yam farmers in your area now practices and adopts the Yam Minisett Technology	172	47.8	2.48	1.07	Rejected
9	Extension Agents regularly visits your community to re-orientate farmers and educate them on the Yam Minisett Technology as a new and improved way of commercially producing yam with ease.	169	46.9	2.47	1.13	Rejected
10	Farmers utilize the Yam Minisett Technology to produce enough yam to meet their annual requirements in your area	170	47.2	2.49	1.09	Rejected
Grand Mean/SD				2.61	1.11	

accepted with average mean of 3.03 and 2.66, which shows that farmers can sow yam minisett directly into the ridges. It also seems simple for farmers to apply yam minisett production technology which would help them produce in commercial quantities. Items 8, 9 and 10 were rejected with average mean of 2.48, 2.47 and 2.49 respectively; as respondents declined that majority of yam farmers in their area do not practice and adopt the technology, extension agents do not regularly visit their communities to re-orientate the farmers and farmers do not utilize the yam minisett technology to produce enough yam to meet their annual requirements in the area. If the presence of extension agents is felt strongly in the study area, it would have a catalytic, stimulating and motivating effect on the yam farmers and induce their adoption of the yam minisett production technology. This finding is in agreement with the report of Agbarevo (2014) and Tasié and Nale (2020) who

in their separate studies affirmed that there was low adoption of yam minisett technology in their study areas. This could be attributed to farmers' conservative approach to life, inability to change from old method to new ways of farming and almost non-existent extension contacts.

Constraints to adoption of yam minisett technology by farmers in Rivers State Agricultural Zone 3

Table 3 as indicated by their various mean scores shows that cost of innovations, lack of technical efficiency and low sprouting rate of minisetts (2.74), poor extension delivery service and the top-down extension approach which does not take cognisance of farmers-identified production problems (2.84), lack of youth participation and involvement in farming (yam production) as a result of search for white-

Table 3. Constraints to adoption of yam minisett technology.

S/N	Items	Farmers				
		Freq.	%	(\bar{x})	SD	Remark
11	High cost of innovations, lack of technical efficiency and low sprouting rate of minisett contribute to the low adoption of the yam minisett technology	196	54.4	2.74	1.12	Accepted
12	Poor extension delivery service, and the top-down extension approach which does not take cognizance of farmers-identified production problems and needs contribute to the low adoption of the yam minisett technology	290	80.6	2.84	1.09	Accepted
13	Lack of youth participation and involvement in farming (yam production) as a result of search for white-kola jobs, leaving the entire production process for the Aged-Parents contributes to the low production capacity in your area.	276	76.7	2.69	1.02	Accepted
14	Socio-economic characteristics such as educational level or background, religious beliefs and unwillingness to change from their old-patterns, contributes to the low adoption rate of farmers in your area.	245	68.1	2.77	1.14	Accepted
15	Lack of land to commercially produce in quantity and other incentives to grow the yam business discourages farmers from going into mass production in your area	273	75.8	2.80	1.16	Accepted
Grand Mean/SD				2.76	1.10	

Table 4. Extent of yam minisett technology utilization influences the yield of yam.

S/N	Items	Farmers				
		Freq.	%	(\bar{x})	SD	Remark
16	Yam minisett grow faster when used than the bigger stem tubers and provide more seed yams for next planting season	350	97.2	3.20	1.08	Accepted
17	Yam Minisett ensures rapid germination and its seed yam do produce tuber earlier than the bigger stem tubers	305	84.7	2.82	1.02	Accepted
18	Yam minisett mature earlier than bigger organs when sown	325	90.3	3.33	1.10	Accepted
19	High yield of yam is obtained when sowing minisett than using bigger tubers	298	82.8	2.77	1.11	Accepted
20	Fertilizer to boost the yield of yam minisett	264	73.3	2.82	1.02	Accepted
Grand Mean/SD				2.99	1.07	

collar jobs (2.69), socio-economic characteristics such as educational level or background (2.77), and lack of land to commercially produce yam in quantity, etc. are constraints to the adoption of yam minisett technology in the area (2.80). This finding is in consonance with Tasie and Nale (2020), Ilesanmi and Akinmusola (2016) and Gagnon et al. (2012). In their separate studies they discovered that farmers will normally adopt an innovation based on its availability, affordability, simplicity, visibility, comparative advantage and compatibility with existing practices. In addition, they opined that the constraints to farmers' adoption of yam minisett technology cut across the five stages of adoption of an innovation, which are awareness, interest, evaluation, trial and adoption. These constraints are awareness, farmers' perception, behavioural factors, socio – economic factors, economic factors, agro – ecological factors, institutional factors and technological factors.

The extent yam minisett technology utilization influences yam yield in Rivers State Agricultural Zone 3

Table 4 shows respondents' level of acceptance to objective four which seeks to ascertain the extent yam minisett technology utilization influences the yield of yam. Yam minisett grow faster when used than the bigger stem tubers and provide more seed yams for next planting season (3.20), yam minisett ensures rapid germination and its seed produces tuber earlier than the bigger stem tubers (2.82), yam minisett mature earlier than bigger organs when sown (3.33), high yield of yam is obtained when sowing minisett than using bigger tubers (2.77), and fertilizer to boost the yield of yam minisett (2.82).

Yam minisett grow faster when used than the bigger stem tubers and provides more seed yams for the next planting season. It also reveals that yam minisett ensures rapid germination, its seed produces tubers earlier, matures

earlier with high yield of yam obtained when sowing minisetts than using bigger tubers. This finding is in line with the finding of Iseki and Matsumoto (2020) who concluded that yam minisetts technology is cost effective and a promising method for effective yam production.

Conclusion

Farmers in the study area can sow yam minisetts directly into the ridges and also find it simple to apply the technology which would help them produce in commercial quantities. Cost of innovations, lack of technical efficiency and low sprouting rate of minisetts, poor extension delivery service and the top-down extension approach which does not take cognizance of farmers-identified production problems, lack of youth participation and involvement in farming (yam production) as a result of search for white-collar jobs, socio-economic characteristics such as educational level or background, and lack of land to commercially produce in quantity etc are constraints to the adoption of yam minisetts technology in the area. Furthermore, farmers are not very much aware and enlightened on yam minisetts technology by institutionalised agricultural research/extension agents. The study therefore revealed that the technique has been proven to be a quick and efficient way of producing seed yams. This implies that yam minisetts application increases the co-efficient of multiplication of seed yams because of its ability to sprout, grow and mature faster and therefore, the findings must be integrated into agricultural transformation agenda and the sectors responsible for training and educating these rural farmers on the need to adopt the minisetts technology such as the extension agents, perform their task effectively. The paper recommends joint efforts of public and private stakeholders to encourage the farmers through training and financial assistance in order to overcome the problem of scarcity and high cost of planting materials at the time needed. There is also a need for more workshops/seminars organized by the Ministry of Agriculture and Agricultural Development Programme (ADP) to enlighten/teach farmers on the benefits of the yam minisetts technology and the practices of minisetts production.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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