ISSN 2056-5429

AN EVALUATION OF FARMERS' ADOPTION OF YAM MINI-SETT TECHNIQUE IN CROSS - RIVER STATE, NIGERIA

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ABSTRACT

Yam (Dioscorea spp) is a staple food in Nigeria. Nigeria is also the world's largest producer of the crop. Efforts aimed at increasing its production should be given greater emphasis as Nigeria is yet to optimize its potentials in producing the crop. The development of the yam mini-sett technology is one of the efforts aimed at boosting the production the crop. Considering the fact that the tuber is the planting material as well as the edible part, the mini-sett technology provides planting material so that the farmer would not worry about what to plant the next season. The study was, therefore, conducted to find out the level of adoption of this technology in Cross-River State, which is a major yam producing area in Nigeria. In conducting the study, 180 yam farmers were randomly selected through multi-stage stratified sampling technique. The state was divided into the three Agricultural Development Programme (ADP) zones. Three blocks were selected from each zone, and two cells from each of the nine blocks selected, giving a total of eighteen cells. Ten farmers were randomly selected from each cell, giving a sample size of 180 farmers. The data used for the study was collected with the use of a structured questionnaire. The researchers were assisted in the distribution and collection of the copies of the questionnaire by the Agricultural Development Programme staff and enumerators. The data on adoption of the technology was analyzed using both descriptive and inferential statistics, the mean and student t-test. The mean was used to determine the level of adoption , while the t-test was used to test the significance of difference between the population and sample means. The study found that the yam mini-sett technique recorded low adoption level among the farmers. It also found no significant difference between the sample and population means. The null hypothesis that there is no significant difference between the sample and population means was accepted at 0.05 level of significance, while the alternative hypothesis was rejected. The paper recommended, among others, vigorous sensitization of farmers on the benefits of the yam mini-sett technology to increase adoption

Keywords: Evaluation, farmers, adoption, yam, mini-sett, technique.

INTRODUCTION

Although Nigeria is the world's largest producer of yams with an annual production of 27 million tonnes, which constitutes about 65% of world's annual production (Nwosu, 2005), its potentials in yam production is yet to be optimized. In fact, it has been observed that Yam production in Nigeria is declining substantially due to many factors, especially cost of planting materials and labour, which account for about 50% and 40% of the cost of production respectively (Nweke *et al.* cited in Okoro, 2008). Yam is a staple food in many African and Asian countries. It is significant in many ways in Africa, and in deed, Nigeria. It 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

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traditional values. It features prominently in traditional marriage, naming ceremonies, traditional festivals. It plays an important role in traditional religion. In some Igbo communities in Nigeria, it is associated with a deity, Njoku (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 technological recommendations or innovations is a means of improving farmers' yield but the low rate of adoption of extension packages of recommendations by farmers in Nigeria has been an obstacle to the realization of this goal. Studies have shown that adoption of such agricultural extension technologies by farmers is low (Agbarevo, 2007; and Imoh and Essien, 2005). Low adoption of agricultural technologies has been attributed to a number of reasons. One reason why adoption has remained low is the cost of adopting the recommendations. Because the rural farmers are poor, they are not always able to purchase improved technological packages from research and extension workers. In this regard, Titilola cited in Agbarevo (2012) 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 (Udealor and Asiegbu, 2006), this would have to be well demonstrated in comparison with local varieties before farmers will adopt the improved varieties.

One of the ways of improving present level of yam production tremendously is through adoption of the yam mini-sett technology. The mini- sett technology was developed in 1982 by National Root Crops Research Institute, Umudike, Abia State, Nigeria. Okoro and Kalu cited Okoro (2008) observed that the mini-sett technology stands out as the most promising in multiplication of yam setts. It is a better alternative to the traditional practice of milking to produce seed yams for planting. Milking involves harvesting yams before full maturity, 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. Milking leads to the production of several (3-6) small tubers suitable for seed yams. Milking is a traditional alternative to the mini-sett technique.

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 - 30% of the farmer's harvest is retained for the next planting season (Nweke *et al.* cited in 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 to less profit for the farmer.

The yam mini-sett technique involves selection of clean and healthy tubers of about 500–1000 grammes, which are cut into rings of about 2-5 cm long and cut further into bits of about 25–60g containing the periderm and some cortex parenchyma. The (bits) yam mini-setts 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 L of water) for about 5–10 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, there have been efforts for cheaper alternatives for producing seed yams for planting, one of which is the production of seed yam through the vine cutting technology (Cabanillas and Martin; Akoroda and Okonmah cited in Eyitayo *et al.* (2010). The technology requires the use of synthesized auxins, which maake adoption of the vine cutting technique by farmers in developing countries, such as Nigeria, difficult (Kikumo *et al*., 2006).

Poor adoption of the yam mini-sett technology was equally reported by Bolarinwa and Oladeji (2009), who observed that, in a sample of 342 farmers in three predominantly yam producing states in Nigeria, 74.0% had received information on the technology; while 71.0% who had adopted the yam mini-sett technology complained that most of the packages were not in line with their yam production practices. The results of a study conducted by Okoro (2004) to determine the level of awareness and use of the technique in Nigeria and seek to know the problems encountered by the farmers, showed that the technology has not been accepted by farmers in Nigeria. It reported that only about 46.6% of the respondents were aware of the mini-sett technique nationwide, while only about 22.4% were using the technique. About 24.2% of the respondents who were aware of the technique refused to use it due to low sprouting rate of mini-sett, which emerged as the greatest problem militating against the technique with 79% of the respondents nationwide complaining about the problem. Other problems reported by farmers included ignorance of technical details (39.7%), technique being labour intensive (38.3%), adverse weather (34.4%), lack of farm inputs (17.8%) and poor storage facilities (1.7%).

Generally, the reasons observed for low adoption included: high cost of innovations, lack of technical efficiency, poor extension delivery service; top-down extension approach, which does not take cognizance of farmer- identified production problems and needs, among other reasons. Resource poor farmers are conscious of their needs and constraints associated with their farming environments in their efforts to realize their goals of production, income, security and conservation of their resource base. Therefore, they weigh the expected benefits of any recommendation from extension against these variables to determine their sustainability or otherwise before adoption. Only recommendations that give the highest promise of meeting such needs are adopted. Therefore, extension efforts aimed at improving the adoption of yam mini-sett and innovations generally, would require an understanding of the existing farming system and how recommended technology can increase productivity by relieving such constraints (Mazur and Titilola, cited in Agbarevo (2005).

Studies have shown that improvement in extension delivery which leads to improved adoption of extension recommendations would lead to the increased crop yield. In this regard, Omagbemi cited in Agbarevo (2009) reported that adoption of improved technological innovations by resource-poor farmers would lead to the increase in farm yields. Nwosu (2005) in a similar study found that adoption of improved cassava technologies significantly increased yield in cassava. Bakare, Ukwungwu, Fademi, Harris and Ochigbo (2004) reported significant increase in yield of rice as a result of adoption of improved rice production

ISSN 2056-5429

technologies. It, therefore, follows that with improved adoption of improved yam production technologies such as mini-sett by resource-poor yam farmers in Nigeria, the nation's total annual production of yam would increase significantly. Against this background, the study was conducted to determine farmers' level of adoption of the yam mini-sett technique in Cross River State, Nigeria. The study, therefore, hypothesized that there was no significant difference between the sample and population means

STUDY AREA DESCRIPTION

Cross River State, which is the area of study, is in the South- South geo-political zone of Nigeria. It is bounded to the south by the Atlantic ocean, to the east by the Republic of Cameroon, to the south-west by Akwa-Ibom State, to the west by Abia and Ebonyi States, and to the north by Benue State. It lies between the co-ordinates of latitudes 6^{o}N and 8^{o}E of the Equator. There are three main cities in the state: Calabar (the state capital) in the south, Ikom in the central zone and Ogoja in the northern zone. The inhabitants of the state are mainly farmers. Most of the local governments have several rivers, which encourage fishing activities. The farmers are mainly resource-poor. Farmers in the south and central zones are predominantly arable crop farmers. Crops produced include maize, yam, cassava, plantain, banana, cocoa yam, etc. However, Ikom in the central zone is noted for production of cocoa in addition to the other crops. Boki Local Government, which is also in the central zone is noted for the production of cocoa and palm oil in commercial quantities. Farmers in the north produce cassava, yam and maize but to a less extent. They, however, produce rice and groundnuts in greater quantities than the other zones. Generally, cassava, yam and maize are the major crops grown in the state.

The state has a population of about 3million and a land mass of 22156 square kilometers with wide expanse of arable lands, which encourage arable and plantation farming. As typical of areas in Nigeria with many rivers, the state has a multiplicity of languages with more than one language spoken in some local governments. Cross River State is adapted to the production of a wide range of crops because of variation in the soil and climatic conditions. The south of Cross River and its environs are essentially mangrove forest, swamp and tropical rainforest. Cross River central is essentially a rainforest belt, while Cross River North is essentially guinea savanna belt.

MATERIALS AND METHODS

In conducting the study, 180 Agricultural Development Project (ADP) yam farmers were randomly selected through stratified sampling technique. The state was divided into three Agricultural Development Programme (ADP) zones. Three blocks were selected from each zone, and two cells from each of the nine blocks selected, giving a total of eighteen cells. Ten farmers were randomly selected from each cell, giving a sample size of 180 farmers.

The data used for the study was collected with use of a structured questionnaire. The researcher was assisted in the distribution and collection of the copies of the questionnaire by Agricultural Development Programme Enumerators. The data on adoption of yam mini-sett technology were analyzed using the mean and population t-test. To obtain an adoption index for each farmer, farmers' responses were categorized into: (a) never adopted (b) adopted and stopped and (c) continuously adopts innovation, to which numerical values 1, 2 and 3 were assigned respectively. The mean response was computed and used as the adoption index. The use of mean as a descriptive statistic was obtained using a 3-point graphic rating scale, which was modified thus: > 2.50 = high , 2.0 – 2.50 = low adoption <2.00= very low adoption. The null hypothesis that there is no significant difference between the sample and population means was tested at 95% confidence level (P ≤0.05). This is given by the formula:

$$\mathbf{t} = \frac{\bar{X}-U}{\frac{s}{\sqrt{n-1}}}$$

where:
$\bar{x}$ = sample mean

s = standard deviation of sample

u = population mean estimate: alpha – level (0.05) $\frac{(S)}{\sqrt{n}} + \bar{X}$
n = size of sample

RESULTS

The result of analysis of data as shown in Table 1 indicates that adoption of the yam mini-sett technique was low. The sample mean was computed to be 2.0501, while the population mean was 2.0514. The two means were subjected to student t-test analysis at 95 per cent confidence, that is, P ≤ 0.05 level of significance. The result showed no significant difference between the sample and population means at 178 degrees of freedom. Therefore, the null hypothesis which stated that there was no significant difference between the sample and population means was accepted, while the alternative hypothesis was rejected.

DISCUSSION

The finding of the study that adoption of yam mini-sett technique was low is supported by similar studies (Agbarevo, 2009; Agbarevo & Obinne, 2008; Agbarevo and Obinne, 2009, Agbarevo and Nwachukwu, 2014). They aobserved that adoption of agricultural technologies by resoutrce –poor farmers has remained low. The reasons adduced for low adoption included: high cost of innovations, lack of technical efficiency, poor extension delivery service; top-down extension approach, which does not take cognizance of farmer- identified production problems and needs, among other reasons. Further in support of the finding of the study, (Ogbodu 1995; Iwueke, 1990, and Okoro, 1999 observed that In spite of the fact that the yam mini-sett can generate large quantities of yams with minimal inputs and less complication in technique., it's rate and level of adoption by traditional yam farmers has been extremely low

Most often, farmers are accused of conservatism, and that their conservative attitude is responsible for low, or non-adoption of recommended technologies. But this has been proved not to be the case most of the time as none of the afore mentioned reasons from similar studies showed that conservatism was responsible for low or non-adoption. In fact a very important reason for non-adoption of some technologies which ,sometimes, is apparently not observed is that no matter how technology might be adjudged good for the farmers, farmers have their own judgment as to whether an innovation meets their needs or not. In this regard, Agbarevo (2012) found that innovations farmers rated high in meeting their felt needs recorded high adoption, while those that recorded low adoption were rated low in meeting farmers' felt needs. The fact that some of the farmers adopted the yam mini-sett technique and later stopped means that it did not address their felt needs, or expectations .

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The findings of Bolarinwa and Oladije (2009) are in still supports the findings of this study, which showed equally that the enthusiasm with which the farmers embraced the yam mini-sett waned as was the case with some farmers in Cross-River. Hence, they later stopped adopting the technology.

Furthermore, The findings of Ogbodu (1995), Iwueke (1990) and Okoro (1999) who reported that the adoption rate of the mini-sett technique was still below 30% agrees with the findings of this study. In the same vein, Iwueke (1990) and Anuebunwa *et a*l., 1998 also discovered that most of the farmers who had adopted the yam mini-sett technique reverted to their local practice as found by the study. They reported six basic reasons given by the respondents for not using the technique, which were basically same as those given by respondents in the studies conducted by Iwueke (1991) and Anuebunwa *et al.* (1998). The only additional reason advanced by farmers in Iwueke's studies was the fact that the minisett technology does not fit into their intercropping farming systems, since it was developed under sole cropping system However, six major reasons given for not using the minisett technique included low percentage germination of setts due to rotting/drying of setts (79.4%), Lack of inputs (17.8%), labour intensive and delay before gain (38.3%), adverse weather (34.4%), ignorance of technical details (39.7%) and poor storage facilities (1.7%). The greatest problem militating against the use of the technique as reported by respondents from all the states was low percentage germination caused by rotting and drying of setts, while poor storage facility was reported to be the least problem.

The biggest problem militating against the adoption of the technique by farmers is the low sprouting rate of mini-setts, and even the ones that sprout do not do so uniformly. This problem is attributed to the rotting and drying up of setts and the problem of epical dominance in tubers (Onwueme, cited in Okoro, 2008). Epical dominance is a phenomenon whereby tubers sprout first from the head region, whether whole or cut setts, followed by the middle portion and lastly from the tail region, due to greater concentration of the hormones which promote sprouting on the head region. This results in non-uniform sprouting of min-setts from various portions of the tuber. This finding on epical dominance, which causes the head region to sprout faster than other parts because of the concentration of hormones that quicken sprouting on the head region is supported by Agbrevo (2002), who in a similar study found that planting setts of the head region sprouted first, followed by the middle region, while the tail region sprouted last with about 20% of the setts from the tail region decaying. This, obviously was one the major reasons why the farmers who adopted the technology initially, stopped adopting it. Moreover, considering the fact that the farmers' alternative to the mini-sett, which is milking, may have been considered adequate in meeting their need for seed yams, the farmers dropped the technology after the initial adoption.

Further in support of the findings of the study, (Ogbodu, 1995;Iwueke, 1990 and Okoro, 1999 observed that In spite of the fact that the yam mini-sett can generate large quantities of yams with minimal inputs and less complication in technique, its rate and level of adoption by traditional yam farmers has been extremely low. The fact that farmers evaluate the extension recommendations for their relevance to their felt needs before adoption is supported by Abalu in Udealor and Asiegbu (2005), who observed that farmers would adopt production technologies they considered compatible with their farming systems. In the same vein Imo and Essien (2005), found that adoption was influenced by the farmers' ascribed value (or relevance) of the technology delivered to them by agricultural extension for adoption; and would only adopt a technology if they ascribed high value to it. It is obvious the farmers did not ascribe high value to the mini-sett technology since milking served the

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same purpose coupled with the fact that rotting was common with the mini-sett technology, and did not fit into their cropping system. Still in support of this view, Bolarinwa and Oladeji (2009) in a similar study reported that, in a sample of 342 farmers in three predominantly yam producing states in Nigeria, 74.0% had received information on the technology; while 71.0% who had adopted the yam mini-sett technology complained that most of the packages were not in line with their yam production practices. It would not be surprising that such farmers would drop the technology after a while as was the case in Cross-River State, Nigeria.

CONCLUSION

Considering the fact that the yam mini sett technique is simple, and does not require huge expenditure to adopt, the paper concludes that all the reasons given for poor adoption of the technology in spite of its advantages amount to the fact that it does not meet the felt needs of the farmers. The farmers did not see the mini-sett technology as a better alternative to milking. Farmers would only adopt a technology when the benefits outweigh existing practice significantly, and this has to be well demonstrated before sustained adoption would take place. This further implies that the greater the relevance of recommendations to farmers' felt needs and ability to fit into existing farming system, the greater the level of adoption would be, and the greater the results would be in terms of farmers' productivity towards meeting the Millennium Development Goal (MDG) on food security. Consequently, the paper recommends vigorous sensitization of farmers on the benefits of the yam mini-sett technology as well as adopting measures that can decrease rotting of mini-setts, which has been identified as a major reason for non-adoption.

TABLE 1: DISTRIBUTION OF FARMERS ACCORDING TO VAROUS LEVELS OF ADOPTION

Never Adopted	Adopted & Stopped	Continuously adopts	Total
60	**29**	**91**	**180**

TABLE 2: POPULATION t-TEST ANALYSIS OF SIGNIFICANCE OF DIFFERENCE BETWEEN SAMPLE AND POPULATION MEANS IN ADOPTION OF YAM MINI-SETT TECHNOLOGY

Groups	N	$\bar{X}$	SD	$P \leq 0.05$	t-cal	Result
Sample	180	2.0501	0.386	1.96	0.05	Not significant
Population		2.0514				

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