Factors limiting the yam minisett technique adoption: A review

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ABSTRACT
The yam minisett technique was developed to overcome the scarcity of seed yams, and has been introduced to farmers more than any other scientifically improved yam propagation method. However, the adoption rate of this technique has not significantly improved over the years. This paper presents an overview of the factors contributing to the low adoption rate of the technique since its deployment in Nigeria. Three main classes of factors influencing the adoption of the yam minisett technology are presented; informational factors, technical factors and economic factors. Among the informational factors, low rate of extension contact coupled with low membership of social groups has negative impacts on the level of awareness of the technology. Issues relating to technical and economic limitations are the major challenges faced by the minisett technique adopters. Among these, the low survival and sprouting rate of minisetts, high labour costs and low level of capital are of utmost importance.

Key words: Adoption, Factors, Farmers, Nigeria, Yam minisett.

Yam, cassava and potatoes are the main annual crops of great importance to farmers after grains. In West Africa, yams are the most preferred for direct consumption as they are cyanide-free and do not undergo post-harvest physiological deterioration like cassava. Food yams belong to the genus Dioscorea and are cultivated in heaps or big ridges with staking required during the vegetative phase to attain good yields (Agbede 2006; Otoo et al. 2008). The crop has a broad range of edible species such as D. alata (water yam), D. rotundata (white yam), D. cayenensis (yellow yam), D. bulbifera (aerial yam), D. esculenta (Chinese yam) and D. dumetorum (bitter yam). Though D. rotundata is more grown and widely consumed in West Africa, its cultivation is seriously constrained by several factors such as poor availability of yam setts, pests and diseases, storage losses and low multiplication ratio of tubers (Aighewi et al. 15; Aighewi et al. 15). Also, the scarcity and expensive nature of seed yams immensely contribute to the total cost of production (Bolarinwa and Oladeji, 2009; Nweke et al. 1991).

The different methods used for planting yams could be conventional or advanced methods. Conventional methods include the milking method, Anambra system, planting cut setts and whole small tuber planting (Aighewi et al. 2015). In these methods, the farmers need to save at least one-quarter of their annual harvest to produce seed tubers for replanting. The modern methods of yam propagation include the botanic yam seed, yam minisett technique (YMT), microsetts and microtubers technology, tissue and organ culture method of producing seed yams, vine cuttings for seed yam production, aeroponics systems for seed yam production, and the temporary immersion bioreactor system (Aighewi et al. 2015; Balogun et al. 2015; Maroya et al. 2014). Among these, tissue culture is capable of producing the best quality of seed tubers and offers an excellent system to detect and eliminate pathogens (Balogun and Gueye 2013; Balogun, 2009).

Traditional methods of production generally have the lowest rate of multiplication when compared to modern methods. Among the advanced techniques in seed yam production, only the YMT, which uses 25–100g tuber pieces, is currently exploited by farmers, but, on a limited scale (Aighewi et al. 2015). This technology was developed in Nigeria by the National Root Crop Research Institute, Umudike, Nigeria. The low-cost method saves more yam tubers for food by increasing the quantity of seed tubers for planting. It explores the ability of any section of yam tubers to develop buds and sprout when a portion of the periderm is included (Onwueme, 1978). YMT does not require elaborate laboratory procedures or scientific expertise as a well-trained farmer can carry it out independently. However, the majority of small-scale yam farmers largely depend on conventional propagation methods and this has reduced the general level of productivity of yam (Aighewi et al. 2015).

Nigeria is the number one producer of yam in the world (FAO 2007). The existing literature has reviewed the adoption of the YMT in Nigeria, but this did not dissect with case studies, the factors slowing down the adoption rate of this technique (Nlerum, 2007). Thus, there is a dearth of information on the factors limiting the adoption of the YMT

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in Nigeria. An understanding of the factors influencing the adoption of this technique is essential for researchers, extension agents and economists for focusing attention on the problematic areas in order to improve the technique further and make it more acceptable to the yam farmers. This paper examines the factors influencing the rate of YMT adoption specifically by answering these questions: (1). what is the relationship between the level of awareness and the adoption of the technique in Nigeria? (2). what socio-economic factors affect its adoption and how are these related to other adoption factors? (3). what are the major challenges experienced by farmers in the adoption of this technique? and (4). how have these challenges limited the overall adoption rate of the technology?

METHODOLOGY

This critical review was conducted to account for the factors influencing YMT adoption by Nigerian farmers. A literature search was carried out using databases such as Scopus, ISI Web of Knowledge, google scholar and, research gate. The search query included keywords such as ‘yam miniset’, ‘adoption’, ‘factors’ and ‘Nigeria’. A total of 125 hits was returned, out of which 72 papers were relevant to the study. The authors were unable to obtain 10 of these articles. The two reviewers assessed the full texts of all the available studies for eligibility and inclusion in the review. The eligibility criteria included the geographical area studied (all the yam growing states in Nigeria) and the category of adopters studied. Three groups of yam farmers adopting the YMT technique were considered: full adopters, partial adopters and non-adopters. Papers that were too divergent from adoption studies and also those that were not undertaken in Nigeria were excluded from the review process.

In the primary papers obtained, different analytic approaches, including quantitative studies, qualitative research and case studies were used to analyse the factors driving the adoption of YMT in yam production. All the papers reviewed were synthesised by identifying and grouping the adoption factors studied. A data extraction form was created to group these factors using the categorisation criteria described by Mwangi and Kariuki, 2015; Tey and Brindal, 2012. This form allowed the final classification of all the factors reported to have facilitated or limited YMT adoption in the country. In exploring the inter-relationships among all these factors, information factors, technological factors and economic factors were isolated and reviewed as the major factors limiting YMT adoption in Nigeria. Thus, this review is a synopsis of 56 YMT adoption studies conducted between 1978 and 2015.

Factors influencing the adoption of YMT

According to Rogers (1992), innovation diffusion goes through five steps. These include awareness, interest, evaluation, trial and adoption. Farmers will normally adopt a technology based on its availability, visibility, affordability, simplicity, comparative advantage and compatibility with existing practices (Gagnon et al. 2012). In addition, the dynamic interaction between these characteristics of an innovation and the current disposition of the farmer determines to a greater extent, the manner and the rate of technology adoption (Loevinsohn et al. 2013). In order to properly dissect the factors limiting the adoption of the YMT, it is expedient to scrutinize all its adoption drivers. Table 1 shows the different categories of factors influencing technology adoption. Among these, farmers’ perception and behavioural factors are the least investigated in YMT adoption studies.

A large number of adoption studies have established significant relationships among farmers’ socioeconomic characteristics and the overall adoption of the YMT (Ajieh, 2012; Ayoala, 2012; Ironkwe and Asiedu, 2008; Madukwe, 1995). These socio-economic attributes refer to the personal predisposing factors of the farmer who makes decisions on adoption or rejection (Tey and Brindal, 2012). Akudugu et al. (2012) grouped the factors affecting the adoption of agricultural technology into three groups, namely; economic, social and institutional factors. Although there are many categories for grouping the determinants of technology adoption, there is no clear distinguishing feature between the variables used for grouping (Mwangi and Kariuki, 2015). With respect to this study, the grouping of these adoption factors will be based on the farmers’ felt needs, the attributes of the minisett technology and the interrelationships among all the adoption factors that have been investigated. Based on the interplay of the adoption factors mentioned above, this study will review the factors hindering the adoption of the YMT by grouping them into information factors, technological factors and economic factors.

Informational factors: The acquisition of information about a new technology enables farmers to learn about the existence, as well as the effective use of the technology, and this in turn, facilitates the rate of adoption (Mwangi and Kariuki, 2015). The awareness stage of adoption signifies the period that an individual is first exposed to an innovation (Ayoala, 2012). Although awareness creation channels for this technique include mass media, farmer-based associations, technology campaign programmes and agricultural exhibitions, the major source of information about the yam minisett technology for Nigerian farmers has been consistently agricultural extension agents (Ayoala, 2012; Okoro, 2008; Asiabaka and Owens, 2002). This confirms that rate at which farmers use innovations highly depends on the level of awareness, mentoring and demonstration by extension agents (Lawal and Oluloye, 2008).

A 18-state wide survey on the awareness and adoption of the YMT by Okoro (2008) indicated that only 46.6% of the yam farmers in Nigeria were aware of YMT,
while about 22.4% were using the technique. Furthermore, the yam farmers in the south-western states were reported to be the least aware of the technology among all the states considered in the study (Okoro, 2008). Similarly, Ajieh (2012) found that farmers had a moderate awareness of the minisett technology in Delta State. Insufficient extension services have been implicated in the low adoption rate of YMT in Nigeria (Anyaegbunam et al. 2009; Okoro, 2008). Broadly speaking, the rate of extension contact and adoption differs in years and in all the regions of the country (Table 2). Where most of these adoption studies did not explore the nature of extension contact used for awareness, increased frequency of extension contact is likely to increase the level of YMT awareness in the country. Moreover, an extension campaign that utilizes several different methodologies of information dissemination will be more effective than contacts relying solely on one-to-one visits (Asiabaka and Owens, 2002).

There exist relationships between farmer socio-economic characteristics and extension contacts in the dissemination of agricultural information. (Asiabaka and Owens, 2002). Farmers’ socio-economic characteristics reported to influence the level of minisett technology awareness include farmer’s age, farm size, gender and membership in a social group. Among these, farmer’s gender influences access to agricultural information and use of

<table>
<thead>
<tr>
<th>Category</th>
<th>Variables</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmers’ perception</td>
<td>The perceived benefits of adopting YMT</td>
<td>Okoro and Ajieh 2015; Tey and Brindal 2012.</td>
</tr>
<tr>
<td>Behavioural factors</td>
<td>The inherent ability of the farmer to adopt new information</td>
<td>Nnandi and Akwiwu, 2007</td>
</tr>
<tr>
<td></td>
<td>- Farming experience</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Gender</td>
<td></td>
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<tr>
<td></td>
<td>- Marital status</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Level of education</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Family size</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Membership of social group(s)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Farm size</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Costs and benefits</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Farm income</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Off-farm income</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Profitability</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Marketing distance</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Availability of inputs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Land tenancy and Land size</td>
<td></td>
</tr>
<tr>
<td>Agro-ecological factors</td>
<td>- Soil quality</td>
<td>Ibok et al. 2015; Tey and Brindal, 2012.</td>
</tr>
<tr>
<td></td>
<td>- Rainfall pattern</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Land tenure system</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Soil type</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Population density</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Farm specialisation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Irrigation facility</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Simplicity/Ease of use</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Comparative advantage</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Trialability</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Visibility</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Affordability</td>
<td></td>
</tr>
</tbody>
</table>

Source: Table constructed from authors’ review of adoption studies on YMT.
innovations. This is largely due to the norms and values of Nigerian communities as male farmers have more freedom in participating in diverse agricultural training; consequently giving them more access to agricultural technologies than their female counterparts (Ibok et al. 2015). Apart from this, most of the yam farmers in Nigeria are males (Ibok et al. 2015; Udoh et al. 2008). The low level of awareness of the technique among women farmers in Abia state supports this (Table 2). The majority of Nigerian yam farmers are in their agriculturally active years because of the labour demand of yam production (Ibok et al. 2015; Waziri et al. 2014; Ajieh, 2012; Ayoola 2012; Ironkwe and Asiedu, 2008; Madukwe, 1995). Young farmers are more knowledgeable in new practices and are more willing to bear risks in agricultural packages (Clark and Akinbode, 1998).

Membership of a social group is the third most significant factor influencing the adoption of agricultural extension technologies by yam farmers in Yakurr Local Government Area of Cross River State (Ibok et al. 2015). This is because extension agents can use social groups as a medium to effectively disseminate innovation to farmers (Ibok et al. 2015). Also, farmers in social groups have more access to social capital enhancing trust, idea and information exchange (Mignouna et al. 2011). Thus, gender, age, and membership of social groups of farmers are the key socio-economic drivers that significantly influence the level of YMT adopted by Nigerian yam farmers. This implies that a young male yam farmer that is a member of many social groups will have the highest adoption YMT more than any other person in a community.

Technical factors: Following the dissemination of an innovation, it is the farmers’ decision whether to adopt it or discontinue it. Although, factors such as comparative advantage, trialability and simplicity play a major role in the adoption of the YMT, the low quantity of seed yam required for planting is the most important in the scale of decision. A survey of farmers in three states of the south-western part of Nigeria showed that a considerable number of the adopters benefitted from the technique, as it generates more seed yam than the traditional vine milking technique (Agbaje and Oyegbami, 2005). Notwithstanding, it is a popular belief that any technology which poses technical challenges to its adopters is more likely to be rejected if the solutions to these challenges are not provided in time.

The YMT comes in different successive components and, most Nigerian farmers do not have the same technical grips with all these components. During the early years of adoption, most of the farmers that adopted the YMT reverted to conventional planting methods because of the difficulties in mastering all the components of the YMT (Anuebunwa et al. 1998; Iwueke, 1990). According to Ajieh, 2012 and Udoh et al. 2008, only the process of cutting into minisetts was the most understood by the farmers, whereas, the application of minissett dust was the least adopted, thereby making the minisetts susceptible to fungi attack. To a great extent, this has affected the overall adoption of all the components of the technology. This implies that an agricultural technology that comes in different successive components is likely to have a low rate of adoption if all its components are not properly understood by the adopters.

The greatest problem militating against the YMT technique is the low sprouting rate of minisetts (Agbrevo, 2014; Lawal et al. 2014; Okoro, 2008). 79.4% of the respondents interviewed by Okoro, 2008 experienced low percentage of germination of setts due to rotting and or drying of setts. Irregular sprouting rates of setts result because various portions of yam tubers have different sprouting capacity. This phenomenon is due to the biological process of apical dominance in tubers, where the higher concentration of some hormones promote the early sprouting of tubers from the head region (in whole or cut setts), followed by the middle portion and lastly from the tail region (Onwueme, 1978). Agbrevo (2002), in a similar study, found that the rate and timing of sprouting of yam setts is the highest when setts are cut from the head region, and this decreases from the middle region to the tail region which has the greatest tendency to decay. Technologies researched to overcome rotting and low sprouting rates of minisetts are shown in Table 3. Out of these, neem wood ash, aqueous neem leaf extract and household bleach are likely to be the cheapest for farmers to use.

Species response is another challenge for YMT and this differs both within and among different yam varieties. According to Ogbonna et al. (2011), some yam varieties respond better than the others. Many differences have also been observed in the response of D. rotundata minisetts (Aighewi 1998). The differences observed in the sprouting capacity within a yam variety may be attributed to apical

Table 2: Extension contact, awareness and adoption rate of YMT in Nigeria

<table>
<thead>
<tr>
<th>Study site</th>
<th>Year of study</th>
<th>Extension contact (%)</th>
<th>Awareness (%)</th>
<th>Adoption rate (%)</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oyo, Ondo and Edo states</td>
<td>2003</td>
<td>61.3</td>
<td>60.0</td>
<td>33.0</td>
<td>Waziri et al. 2014.</td>
</tr>
<tr>
<td>Yam Belt (18 states)</td>
<td>2004</td>
<td>45.2</td>
<td>46.6</td>
<td>22.4</td>
<td>Okoro, 2008</td>
</tr>
<tr>
<td>Kogi and Benue states</td>
<td>2010</td>
<td>75.8</td>
<td>98.3</td>
<td>9.32</td>
<td>Ayoola, 2012</td>
</tr>
<tr>
<td>Niger State</td>
<td>2012</td>
<td>7.2</td>
<td>41.6</td>
<td>22.4</td>
<td></td>
</tr>
</tbody>
</table>
dominance, whereas, varietal effects have stronger effects on the rate and timing of sprouting of directly planted setts (Ayankanmi et al. 2005). Planting bigger sizes of minisetts in some yam varieties have been suggested to enhance their sprouting potential (Ayankanmi et al. 2005). Pre-sprouting minisetts in a pest and disease free medium can also increase the chances of minisset survival, but this is more tedious (Okoli and Akoroda, 1995). However, most Nigerian YMT adopters did not adopt pre-sprouting owing to the extra care required in maintaining nurseries and transplanting process, which are more labour intensive and not compatible with their existing farming practices (Lawal et al. 2014).

In some cases, the technology did not fit into the farmers’ intercrop systems, since it was developed under sole cropping system (Ayoola, 2012; Okoro, 2008). Mixed cropping is the predominant farming system among farmers in Nigeria (Ibok et al. 2015). It is a crop failure aversion strategy used by poor farmers for managing soil fertility, reducing costs and saving time (Ibeawuchi, 2007). According to FAO (1997), farmers only adopt the practices they are familiar with, and, which are in line with existing practices. In some communities where yam was previously intercropped with other crops such as maize, the YMT fitted well into their intercrop systems. (Udoh et al. 2008; Ajieh, 2012). However, reports from Ayoola, 2012 revealed that many YMT adopters do not stick to the intercrop spacing recommended by extension agents.

Other reports also indicated that the major problems hindering the adoption of yam minisettt technology included the tediousness of the practice, scarcity of treatment chemicals, harvest reduction resulting in small sized tubers and time wastage (Ayoola, 2012; Ajieh, 2012; Agbaje and Oyegbami, 2005). Though, the farmers in Delta state noted that air drying was not necessary, they complained about the unavailability of minissett dust, high cost of dust and the harmful nature of the dust. (Ajieh, 2012). All the technical challenges noted above significantly influence farmers’ perception of the technology. Farmers’ perception about the performance of the technology in return influences their decision to adopt them. Regardless of this, formal education and literacy influence the acceptance of agricultural innovations (Omotesho et al. 2012; Udoh et al. 2008). This is because educated farmers will be able to easily grab innovation details, read and interpret extension leaflets (Ibok et al. 2015; Udoh et al. 2008).

### Economic factors
The following economic factors have been identified in the literature to have a high influence on the farmers’ level of adoption of YMT. These include farmers’ income, labour cost, access to credit facilities, farm size and availability of farm inputs. In the 1990s, minisett-based yam production was highly unprofitable as a result of the high cost of farm inputs incurred (Madukwe, 1995; Nwueke et al. 1991). Lack of farm inputs and poor storage facilities has persisted over the years and was reported in 18 states of the country (Okoro, 2008). Significant farmers’ socio-economic characteristics found to influence the economics of yam minissett production include age, gender, educational status, membership of societies and household size (Ibietoye et al. 2013; Gbegeh and Akubuilo, 2012). Where productive age, male gender, membership of societies and household size have been reported to promote YMT adoption (Ibok et al. 2015; Ajieh, 2012; Gbegeh and Akubuilo, 2012), an increase in the number of years spent in school by a farmer will likely lead to a reduction in YMT adoption. This may be attributed to the fact that most of the yam farmers with higher educational qualifications tend to shift from full-time farming to other major occupations to derive additional income (Ibietoye et al. 2013).

YMT adoption has been positively correlated with net farm income (Achoja and Uzokwe, 2012; Ogbonna et al. 2011; Adekayode, 2004). In spite of this, the majority of yam farmers interviewed in Nigeria are small scale and low-income earners with little or no access to credit resulting in the low adoption of the technology (Ibok et al. 2015; Waziri et al. 2014; Udoh et al. 2008; Achoja and Uzokwe, 2012). This confirms that a primary determinant of the adoption of a new technique is the net income to the farmer from adoption, with respect to all other expenses in using the new technology (Foster and Rosenzweig, 1995). Higher-income farmers tend to be less risk averse and continue with the adoption of the technique. In other words, farmers with high income can afford to experiment with part of their farmland which may lead to YMT adoption, unlike resource poor farmers who may be solely depending on the little income from their farming activities.

The amount of credit available to farmers is also positively related to YMT adoption (Ayoola, 2012). Access to formal credit facility is generally poor among yam farmers (Ibok et al. 2015; Lawal et al. 2014). The availability and access to credit promote the adoption technologies that are risky and labour intensive (Simtowe and Zeller, 2006). YMT adoption is labour intensive and includes labour costs arising

### Table 3: YMT innovation packages for improved sprouting rate

<table>
<thead>
<tr>
<th>Class</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protectants and</td>
<td>Benlate</td>
</tr>
<tr>
<td>disinfectants</td>
<td>Quick lime</td>
</tr>
<tr>
<td></td>
<td>Neem wood ash</td>
</tr>
<tr>
<td></td>
<td>Aqueous neem leaf extract</td>
</tr>
<tr>
<td>Hormone amendments</td>
<td>Ethephon (2-chloroethylphosphonic acid)</td>
</tr>
<tr>
<td></td>
<td>Benlate</td>
</tr>
<tr>
<td></td>
<td>Sodium hypochlorite</td>
</tr>
<tr>
<td></td>
<td>(household bleach)</td>
</tr>
</tbody>
</table>

Adapted from Asare-Bediako et al. 2007; Offei et al. 2006; Swain et al. 2007.
from land preparation, minisett cutting and treatment, pre- 
sprouting, planting, mulching, weeding, staking, fertilizer 
applification, pesticide application, harvesting and storage. 
Labour alone can account for 78.1% of the production cost 
and, most YMT adopters use hired labour which is expensive 
and sometimes unreliable (Eyitayo, 2010). The high cost of 
labour was found to be a major constraint to the adoption of 
Without credit facilities, high costs of labour and farm inputs 
immensely contribute to the expenses in YMT thereby 
making it to be financially demanding for smallholder 
farmers to adopt.

Farm size is one of the indicators of farmers’ wealth 
and influence within a rural community (Gbogbeh and 
Akubilo, 2012). Most Nigerian yam farmers use only family 
or communal land tenure system (Ibok et al. 2015). The 
majority of the YMT adopters interviewed by researchers 
allocated less than 0.3 hectares of land to minisett production 
(Agbaje and Oyegbami 2005; Waziri et al. 2014). According 
to Udoh et al. 2008, an increase in farm size will not always 
result in an increase in adoption of minisett technique. This 
may be due to the fact that farmers cannot utilize all their 
land to yam minisett production since they have to cultivate 
other crops to sustain their family (Agbaje and Oyegbami, 
2005). Thus, farm size is not a major economic factor limiting 
the adoption of the YMT.

CONCLUSION

Despite the high potential of the YMT in increasing 
the profitability of yam enterprise, its overall adoption rate 
is still low. The rate at which the technology has been adopted 
differs with location, level of awareness, farmers’ technical 
ability and farmers’ economic circumstance. Socioeconomic 
factors like productive age, gender and membership of social 
groups are positively related to the adoption of the YMT 
and will likely influence all other adoption factors. Though, 
face to face extension contact is the main channel of 
agricultural information to the yam farmers, a combination 
of various complementing extension methodologies to boost 
farmers’ awareness of the technique would be more effective. 
Also, the low level of literacy that characterizes the 
agricultural production system of Nigeria is one of the factors 
to seriously bear in mind while disseminating the YMT.

Future adoption studies on this subject should take 
into consideration each component of the technology. Species 
response to the technique and sett size effects need to be 
 systematically incorporated into YMT extension training. The 
establishment of yam minisett seed units in seed 
companies will facilitate the production of clean yam seeds. 
Researches that lead to low-cost technologies with focus on 
overcoming the rotting and low sprouting rate of cultivars 
should be validated and deployed to farmers. Lastly, this 
technique needs more study by researchers taking into 
account factors like rapid sprouting of yam setts, sett 
treatment, locational responses, cropping systems and 
population density. There is also the need to deploy 
appropriate technologies to reduce the production costs 
of the technique to increase the profitability of yam 
production.

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of the technique to increase the profitability of yam 
production.


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