Discontinuance of Yam Minisett Technology (YMT) utilisation by farmers in Benue State, Nigeria

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Abstract. The study examined the discontinuance of Yam Minisett Technology (YMT) utilization by yam farmers in North-central Nigeria. Simple random sampling technique was used to select 150 respondents. Both descriptive and inferential statistics were used to analyse data collected. Findings showed that majority of the respondents were males (94.7%), married (75.3%), no formal education (60.0%), no secondary occupation (74.7%), mean age (42.5 ± 47) and household size (5.7 ± 1.8) and small farm size (48.0%). Discontinued package of the innovation include: sole cropping system (37.3%), seed treatment with minisett dust (30.7%), pre-sprouting (28.0%) and staking using pyramid or trellis (26.7%). Reasons for discontinued utilisation are poor input supply and accessibility (86.7%), poor farm financing (82.0%), poor extension services (visit and follow-up) (74.7%) and poor farm labour supply (68.0%). PPMC result shows significant relationship ($r = -0.895$, $p = 0.000$) between farmers socio-economic characteristics and YMT discontinuance, and T-test statistics at 0.01 level of significance indicated that the output of farmers who discontinued are significantly less (3.68) than farmers who continued to utilize YMT. It was thus concluded that discontinued utilisation of YMT could lead to significant decline in seed-yam production, farm size and income of farmers. Therefore continuous utilisation of YMT is recommended with appropriate input supply, provision of interest free farm credit, improve extension-farmers contact, and development of YMT to thrive under mixed cropping.

Keywords: Discontinuance, minisett, technology, utilization.

INTRODUCTION

Yam, *Dioscorea* spp., is an important tuber crop mostly cultivated by men, the reason been that the crop is traditionally regarded as man's crop (Manyong *et al.*, 2001). The crop when harvested at maturity can be processed and eaten in various forms by most people; boiled, fried, roasted, as yam flour, pounded yam, yam chips or porridge (Fasasi, 2006).

Yam is important for food, income and socio-cultural activities (Ironkwe, 2010). It also remains the preferred starchy staple for many people in the yam belt of West Africa. However, it is the most expensive of the root crops to produce because of the high labour demands for land preparation, planting, staking, weeding, harvesting and transport to market. Also, planting material (seed yam) is expensive and in short supply because of the low

multiplication rate of yams. Benue Agriculture and Rural Development Authority-BNARDA (2001) and FAO-Stat figures (2006) recorded that, in Nigeria, the average yield of yam appears to have been steadily declining over the last 8 to 10 years resulting from scarcity of planting materials (FAO, 2008).

Yam productivity in the main yam-growing belt of West Africa is reduced by losses in the growing crop, and in subsequent storage, due to diseases and pests. Many of these are either spread in, or exacerbated by poor quality planting materials (Kenyon, 2006). A package of crop production technologies was developed (based on current practices, indigenous technical knowledge and the outputs from previous projects) for producing good quality seed yams and promoting their supply and

availability. This package is YMT which was developed by National Root Crop Research Institute (NRCRI), Umudike and International Institute for Tropical Agriculture (IITA), Ibadan (NRCRI, 2005). The package was validated for applicability and economic efficacy by growers and was shown to be suitable for wider adoption in Nigeria.

Problem statement

Decline in yam production due largely to inadequate access to seed-yam for growing new yam farm have been reported to be a major challenge in Nigeria (FAO, 2008). To alleviate this challenge, Yam Minisett Technology (YMT) developed through the collaborative effort of NRCRI-Umudike and IITA-Ibadan has been disseminated to yam farmers in the study area for onward adoption over two decades now. The expected increased productivity is readily noticed. Obinne (1992) in Saror *et al.* (2009) noticed that the main problem with Nigerian agriculture is no longer research results but utilisation of the result for increased sustainable productivity. Secondly, adoption process which is a combination of stages the farmer goes through from awareness to adoption could be a cause as the farmers could discontinue if a problem he cannot overcome ensue along the line after previously adopting it for some time (Saror *et al.*, 2009). This is to show that not all farmers persist or continue with an innovation even after adopting it. Some authors previously noted low income and inadequate access to production resources, lack of process understanding and manpower implementation all of which may lead to unsatisfactory outcomes as possible causes of discontinuance. This abandonment of earlier adopted technology may lead to decline in productivity.

Previous studies show that yam production have not appreciably increased, even though a reasonable population of yam farmers have keyed into YMT before, it has either been static or on a decline (BNARDA, 2001; Fasasi, 2006). This may be because majority of yam farmers who utilised YMT before have discontinued its utilisation. Based on the foregoing, the following research questions arise to guide this study:

1. What are the socio-economic characteristics of yam farmers in the study area?
2. What are the YMT packages introduced in the study area?
3. What are the reasons for discontinuance of YMT utilisation in the study area?

Objectives of the study

The general objective of the study is to identify the reasons for discontinued YMT utilisation in the study area. While the specific objectives are to:

1. Describe yam farmers socio-economic characteristics (SEC) in the study area.
2. Ascertain the YMT packages discontinued by farmers in the study area.
3. Determine the percentage of farmers who have discontinued YMT utilisation in the study area.
4. Identify the reasons for discontinuance of YMT utilisation in the study area.
5. Determine the effect of the discontinuation of YMT utilisation in the study area.

Hypothesis of the study

Hypotheses of the study are formulated in the null form as follows:

1. There is no significant relationship between the SEC and YMT discontinuance in the study area.
2. There is no significant difference between the output of farmers who continued and those who discontinued YMT utilisation in the study area.

MATERIALS AND METHODS

Area of the study

The area of the study is Benue State which is in North-Central agricultural zone of Nigeria. The North-Central agricultural zone of Nigeria is a major yam producing zone that produces 34% of the 70% world yam grown in Nigeria (Oluyomi, 2010). Benue State was purposively selected being a major yam producing state in the selected zone in Nigeria where YMT have been disseminated to farmers for over four decades and some farmers who were utilising it initially have dumped the technology (Saror *et al.*, 2009).

Sampling procedure and sample size

The ADP structure was followed to obtain the sample size. A multistage sampling technique was used for this study. Simple random sampling techniques were used to first, select two of the three ADP zones in the state (Zones A - Adikpo and B - Olukpa), 50% each of blocks and cells were selected and 12.5% contact YMT adopters from which a total of 150 respondents were obtained.

Data collection and analysis

The quantitative method used to collect data for this study was interview schedule. Descriptive statistics such as frequency count and percentages and inferential statistics such as Chi-square and PPMC were used to test hypotheses formulated.

Table 1. Distribution of respondents according to their socio-economic characteristics (n = 150).

Characteristics	Total		Mean
	Frequency	%	
Age (in years)			
> 31	30	20.0	
31 – 40	35	23.3	
41 – 50	69	46.1	42.5 ± 4.7
51 – 60	14	9.3	
> 60	2	1.3	
Sex			
Male	142	94.7	
Female	8	5.3	
Marital status			
Single	24	16.0	
Married	126	84.0	
Household size			
<5	34	22.7	
5-10	85	56.6	57±1.8
>10	31	20.7	
Formal education			
Yes	60	40.0	
No	90	60.0	
Primary occupation			
Farming	113	75.3	
Others	37	24.7	
Secondary occupation			
Yes	38	25.3	
No	112	74.7	
Years of farming experience			
<5years	12	8.0	
5-10 years	43	28.7	13.0±5.6
11-20 years	83	55.3	
>20 years	12	8.0	
Farm locations			
One site	51	34.0	
Scattered	99	66.0	
Farm size			
<1 acre	72	48.0	
1-2 acres	63	42.0	1.8±0.8
>2 acres	15	10.0	
System of YMT production			
Sole cropping	63	42.0	

Table 1. Contd.

Mixed cropping	87	58.0	
Sales outlet			
In heaps	22	14.7	
Farm gate	76	50.6	
Local market	52	34.7	
Annual income			
Less than = ₦50,000.00	21	14.0	
₦50,000.00 - ₦100,000.00	96	64.0	40.150±3.0
>₦100,000.00	33	22.0	
Member of farmer co-op association			
Yes	117	78.0	
No	33	22.0	

Source: Field Survey 2013

RESULTS AND DISCUSSION

Socio-economic characteristics of yam farmers

Results in Table 1 shows that for age, majority (38.6%) of respondents were between 41 and 50 years with a mean age of 43.5 ± 14.7 obtained indicating that 46.1% of the respondents were within the mean age and above. This implies that the farmers were young, still in their active and productive ages and are more responsive to new agricultural technologies. This finding is consistent with that of Yekinni (2011) who reported a mean age of 43.2 years for farmers in Nigeria. Majority (94.7%) of respondents were male while 5.3% were female. Yam production is exclusively male enterprise because of the rigour involved in all aspects of its productions such as land clearing, sett preparation, planting, weeding, staking, training of vines and harvesting. This finding is in consonance with the study by Omotesho *et al.* (2012) who reported that all yam farmers in Kwara state were male and this is most likely to be due to the fact that men are more capable of doing tedious work which is usually associated with yam farming than the female.

Majority (84.0%) of respondents were married while 16.0% were single. This implies that marital status may become an important factor too in agricultural production especially when farm labour supply is limited. This is in tandem with Ayanda *et al.* (2010) who in a study of rice farmers in Kwara State observed that 85.3% of respondents were married.

Majority (56.6%) of respondents had between 5 and 10 household size and the mean household size was 5.7 ± 1.8. This result depicts a small household size among respondents. This implies that most of the respondents have small household sizes. This finding is in tandem with Tologbonse and Adekunle (2000) who reported that

majority of the rural farmers had more than 6 people as dependants.

Majority (60.0%) of respondents had no formal education. This finding is in consonance with the findings of Ojemade (2010) who reported that majority of Nigeria's farmers are non-literates. Majority (75.3%) of respondents engaged in farming as their primary occupation This finding is consistent with that of Ogbonna *et al.* (2011) who found that, agriculture provides employment to about 75.0% of Nigerian populace. Majority (74.7%) of respondents do not engage in any secondary occupation. This implies that many of the respondents may not get additional sources of income. This finding does not agree with that of Olawoye (2000) who stated that many households engage in several income-generating activities in order to meet other household, social and economic needs. Majority (55.3%) of respondents had between 11 and 20 years of farming experience and the mean years of farming experience was 13 ± 5.6. This implies that majority of the respondents had reasonable years of yam farming experience that would enable them have adequate knowledge of agricultural activities involved in yam production that would enable them utilise YMT. This is in line with the findings of Agbongiarhuoyi and Daniel (2009) who reported that majority of respondents are not less than ten years in farming business.

Majority (66.0%) of respondents grow yam on scattered plots because they had more than one plot of yam farm, because they grow yams on both Fadama and upland. This finding is in agreement with that of Nwaru (2007) who stated that arable land is a very important resource in farming in Nigeria, but the scattered nature of farm holdings in the country is the practice of Nigeria peasant farmers and it is a problem to agricultural transformation. This implies that majority of respondents grow yam on

scattered plots and this practise is not a healthy practice towards adopting YMT. Higher proportion (48.1%) of respondents had less than one acre of yam farm and the mean of farm size in acres was 1.8 ± 0.8. This finding is similar to that of Ogbonna *et al.* (2011) who reported that majority of Nigeria farmers are smallholder farmers with small farm sizes of less than 1 hectare and this situation may bring about the non-adoption of agricultural technologies since adoption is a function of availability of appropriate farm size. In the same vein, Ironkwe (2010) reported that farm size influences adoption of new technology, because owners of large farms usually have more resources than small-scale farmers since adoption of technologies requires relatively large area of land. This implies that yam farm sizes in the study area were small and this is unhealthy for any meaningful adoption and utilisation of innovation like YMT to take place since extra land would be required to increase production.

The recommended system of YMT production is sole cropping without intercropping with any other crop, but majority (58.0%) of respondents practised mixed cropping. This finding is in consonance with Ikeorgu (2000) who reported that YMT was developed under monoculture but most farmers preferred and practised intercropping. This implies that majority of respondents in the study area practised mixed cropping in utilising YMT with crops like: maize, guinea corn, pepper, okro, melon, cowpea, groundnut and ammarantus which is in line with their traditional practice of maximizing the use of available land and its resources and as a remedial against total crop failure and to control weeds, pests and disease infestation. But this is a complete deviation from YMT recommendation. This may have negative effect on the level of YMT utilisation and the expected benefits to be derived from the technology. Majority (50.6%) of respondents sold yam farm gate, 34.7% sold at local market while 14.7% sold yam in heaps. The implication is that majority (65.3%) sold yam to middlemen who took same to local or urban markets for sale. This finding is in consonance with that of Makhura *et al.* (2001) who reported that in developing countries, smallholder farmers find it difficult to participate in markets because of a range of constraints reducing the incentives for participation. Idachaba (2000) noted such constraints in Nigeria as lack of adequate market infrastructure and market information that would have enabled them take full advantage of their labour. Similarly, Oluwasola *et al.* (2008) corroborated by Okoye *et al.* (2010) reported that geographical distance imposes higher transport cost on rural farmers, thereby reducing their ability to sell in better but far-away markets. Thus long distances to selling points or markets predispose farmers to on-farm sales and to reduced transaction cost also referred to as low producer prices paid to farmers and consequently low income which does not encourage farming and even adoption of technologies that may result into increased production. This implies that the inability of respondents to sell at the market may

have negative influence on YMT utilisation. Majority (64.0%) of respondents make an annual income of between ₦50,001.00 and ₦100,000.00, 22.0% make between >₦100,00.00 while 14.0% make less than ₦50,000.00. The mean annual income from yam was ₦40,150±3.0. This is finding is in line with Ayoola (2012) who reported that majority 55.0% of farmers earned less than ₦100,000.00 annually a very low farm income, with implication for resource-poverty, small scale production and low adoption of new technology. In the same vain Okoye *et al.* (2010) reported that farmers low level of production and lack of producers direct access to markets do not make them always have fair remuneration for their investment and this has been a barrier to adoption of technologies which would have translated into large scale agricultural production and improved income. This implies that annual income was generally low among respondents in the study area. This may largely be due to low level of production, caused by low access to production resources and inadequate access to market information and market; this will have negative effect on YMT utilisation. Majority (78.0%) of respondents were members of yam farmers association while 22.0% were not members. This finding is in consonance with the position of Oguntade *et al.* (2010) who observed that the social participation of farmers through their involvement in farm organisations will enhance the diffusion of information among them and enhance their access to government assistance in form of loan and other inputs. Similarly, Odurukwe *et al.* (2003) and Spore (2011) found that the more a farmer belongs to farm organisations, the more likely he will be pre-disposed to adopt new farm practices. In the same vain Omotesho *et al.* (2012) reported farmers association are vital sources of information on agricultural innovations. This implies that since a good number of respondents were members of yam farmers association, this may enhance their access to information on YMT and its utilisation.

Respondents' YMT utilisation

Results in Table 2 reveal that 68.0% of the respondents still continued YMT utilization while 32.0% discontinued. This implies that majority of the respondents use YMT to achieve desired objectives. This is in consonance with Saror *et al.* (2009) who found that 34.0% of respondents discontinued adoption of agricultural innovation among small scale Soy-bean farmers in Gboko L.G.A. in Benue State, Nigeria.

YMT packages discontinued

Results in Table 3 show that YMT packages that were discontinued include: sole cropping (37.3%), seed treatment with minisett dust (30.7%), pre-sprouting

Table 2. Distribution of discontinuance of YMT package (n = 150).

Discontinuance of YMT utilisation	Frequency	Percentage
Discontinued YMT utilisation	48	32.0
Continued YMT utilisation	102	68.0
Total	150	100.0

Source: Field Survey (2013).

Table 3. Distribution of YMT packages discontinued (n = 150).

YMT packages discontinued	Frequency	Percentage
1. Select tubers that have broken dormancy	13	8.7
2. Sterilise Knife before use and intermittently	21	14.0
3. Seed treatment with minisett dust	46	30.7
4. Spread minisett under shade to air-dry	31	20.7
5. Pre-sprout minisett in nursery for 3 to 4 weeks	42	28.0
6. Transplant with short vines without open leaves	33	22.0
7. Staking using Trellis or Pyramid	40	26.7
8. Chemical weed control	25	16.7
9. Fertilizer application (compound fertilizer)	17	11.3
10. Open-air storage in shaded barns or racks	18	12.0
11. Sole cropping	56	37.3

*Multiple responses. Source: Field Survey (2013).

Table 4. Distribution of respondents' according to reasons for discontinuance of YMT (n = 150).

Reasons for discontinuance of YMT	Frequency	%	Mean
Poor extension follow-up	112	74.7	0.3 ± 0.5
Non-availability/poor input supply	130	86.7	0.3 ± 0.6
Poor finance	123	82.0	0.3 ± 0.5
Poor labour supply/ labour intensive	102	68.0	0.3 ± 0.4
Non-availability of Land	11	7.3	0.1 ± 0.0
Technical-know-how/too technical	82	54.7	0.2 ± 0.4
Lack of market information	90	60.0	0.2 ± 0.5
Not sure of ready market	94	62.7	0.2 ± 0.5
Complex method	38	25.3	0.1 ± 0.7
Expected result not obtained	63	42.0	0.1 ± 0.4
Experienced poor minisett sprouting	74	49.3	0.1 ± 0.5
Seed-yams produced were too small	42	28.0	0.1 ± 0.7
Non-compatibility with intercropping system	100	66.7	0.3 ± 0.4
Time wasting because of double planting	76	50.6	0.2 ± 0.3
Conflict with norms/culture	10	6.7	0.1 ± 0.9

Mean = 0.2 ± 0.5. Source: Field Survey (2013).

(28.0%), staking using Trellis or Pyramid (26.7%), transplant with short vines without open leaves (22.0%), and spread minisett under shade to air-dry (20.7%).

Reasons for discontinuance of YMT utilization

Results in Table 4 indicate respondent's reasons for discontinuance of YMT utilisation as poor input supply and accessibility (63.3%), poor farm financing (60.0%), poor extension services (visit and follow-up) (56.7%), sole cropping system (53.3%) and poor farm labour supply (46.6%). This finding agrees with that of Odurukwe *et al.* (2003) in a related study who reported that, most yam farmers who had adopted YMT reverted back to their old practice for reasons like: poor sprouting,

Table 5. PPMC analysis showing relationship between the SEC of farmers and discontinued YMT.

Variable	r-value	p-value	Decision
SEC of farmers and discontinued YMT	-0.895**	0.000	Significant

** Correlation is significant at the 0.01 level (2 tailed). Source: Field survey (2013).

Table 6. Result of T-test showing differences between farmers who continued and those who discontinued YMT utilisation.

Statistics	Output of those who discontinued	Output of those who continued
Mean	36,816.22	66,980.29
Standard deviation	30,598.58	47,313.26
Standard error of mean	4,675.7884	5,688.9560
N	48	102

Source: Field Survey (2013).

small size of seed-yam, laborious processes, scarcity and high cost of required inputs, poor extension follow-up and that it does not fit into their intercropping farming system, since it was developed under sole cropping system. In a similar study, Mustapha *et al.* (2012) reported confirmed cases of discontinuance of adoption of this technology, because it was found not to be compatible with the local practices of the rice farmers in the case of NERICA 40. By inference, therefore, technologies earlier considered compatible by farmers would suffer less continuance than those regarded not compatible with their local practice.

On poor extension follow-up, Olawoye (1993) in similar study reported that, though farmers have had extension training and have showed encouraging adaptive behaviour in the past, without careful monitoring of these farmers' conditions, regressive trends may occur and farmers overwhelmingly attributed these trends to economic constraints. In the same vein, Saror *et al.* (2009) in a related study reported that, the main problem with Nigerian agriculture is no longer lack of research results but, adoption and continuous utilisation of research results for increased and sustainable productivity. It is possible that the identified reasons for YMT discontinuance were severe challenges encountered by respondents which they could not overcome during YMT utilisation. The attention of all stakeholders in the agricultural sector to alleviate these challenges so that farmers can take up the technology and continue to use it is urgently required.

Hypothesis testing

Hypothesis 1: There is no significant relationship between the SEC and discontinued YMT by farmers in the study area.

The hypothesis is tested relationship between the SEC of farmers and discontinued YMT in the study area. The hypothesis was tested using PPMC (r). The results contained in Table 5 indicate that significant relationship (r = -0.895, p = 0.000) existed between farmers SEC and discontinued YMT in the study area.

Hypothesis 2: There is no significant difference in the output of farmers who continued and those who discontinued YMT utilisation in the study area.

The hypothesis tested difference between output of those who continued and those who discontinued YMT utilisation in the study area. The hypothesis was tested using T-test and the result in Table 6 shows that T-cal is greater than T-tab (2.41) therefore the null hypothesis is rejected and the alternative upheld. This implies that there is a significant difference in the value of output between farmers who continued and those who discontinued YMT utilisation.

CONCLUSION

The utilisation of YMT is widely accepted by farmers in the study area because increased plating materials, farm size and income is guaranteed by it. However, some farmers discontinued the use of some aspects of the package like sole cropping, seed treatment with minisett dust, pre-sprouting and staking largely due to poor input supply, farm finance, extension follow-up and farm labour supply.

RECOMMENDATIONS

To discourage farmers from discontinuing YMT utilisation and encourage its continual use, it is recommended that: government through extension agents should be improved input supply to farmers at affordable prices,

required quantity and places and right time. The apex bank (Central Bank) should be directed by government to mandate commercial banks and Bank of Agriculture (BOA) to give interest free farm finance to intending farmers especially large scale farmers. Government should provide all that extension agents would require to enable them make adequate extension follow-up which should accompany the dissemination of YMT to sustain farmers' use of the technology and productivity. Government should direct NRCRI-Umudike in collaboration with IITA-Ibadan to improve on the present YMT in order to make it compatible with farmers mixed cropping system.

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