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Adoption of improved white yam (*Dioscorea rotundata*) varieties in Ghana: The role of farm and farmer characteristics

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ABSTRACT

Yams (*Dioscorea spp*) in Ghana are important food staples and the most important non-traditional export crop contributing to foreign exchange and incomes of smallholder producers. Research and development of the crop over the years produced and release three improved *Dioscorea rotundata* varieties in 2005. However, adoptions of these varieties have been very low. Using cross-sectional data from 544 randomly selected yam farmers and employing the logit model, the farm and farmer characteristics that influence the adoption of yam varieties were assessed. Results revealed the awareness level of improved yam varieties at 50% and low adoption rate of improved yam varieties at about 6%. Factors found to significantly influence adoption were awareness, education, distance to farm and extension access. The study suggests the need to create more awareness and education on the improved yam varieties in order to sensitize farmers and encourage adoption. There is also the need to improve research extension linkage system to enable technology knowledge transfer to extension staff for easy diffusion to farmers.

Keywords: Awareness; extension access; education; logit model; smallholder farmers
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Introduction

One of the primary goals of Ghanaian agricultural development programmes and policies is increasing agricultural productivity for accelerated economic growth. Predominantly, majority of Ghanaians depend on agriculture for their livelihoods thus, the agricultural sector has been recognized as important for driving economic growth, overcoming poverty, and enhancing food security (MoFA, 2007; MoFA, 2010). As a result, governments and donor agencies have made efforts over the years to increase production of important food staples. Yams are one important food staple that has received increased attention over the past decades. Yams are ranked second in importance (in tonnage terms) after cassava in staple food production (MoFA, 2016). They are much sought-after food, with an estimated average national annual per capita consumption of 125 kg (MoFA, 2016). Ghana is the world's largest exporter of yams and exports of Yam from Ghana increased fromUS$32.599 million in 2017 to US$37.986 million in 2018 (Ghana Export Promotion Authority, 2019).

Sufficient research efforts have gone into yam improvement programmes due to its importance to the economy and to the many people that depend on it for livelihoods. Many improved yam varieties and complementary technologies have been developed and released but minimally disseminated to farmers. In Ghana, yams were prioritized under the Accelerated Agricultural Growth and Development Strategy (Technology Sub-committee, 1998). Since then national research programmes such as the Agricultural Services Sub-sector Investment Programme (AgSSIP) in 2000 (World Bank, 2007b), and then the Root and Tuber Improvement and Marketing Program (RTIMP) funded research on Root and Tubers including yams and in 2005 three yam varieties (CRI-Pona, Makron Pona and Kukrupa) which were high yielding disease resistant and acceptable for its culinary characteristics were released. Other agronomic packages such as minisett technology, ridging, minimal staking (trellis) etc, have also been disseminated. In 2008 the West Africa Agricultural Productivity Program (WAAPP) was initiated to develop improved technologies for root and tuber crops of which yams were supported (World Bank, 2007a).

Yam production has been increasing over the years from 12.8 t/ha in 1996 to about 17 t/ha in 2018 (MoFA, 2019). However, an estimated yield gap of about 32 t/ha persists due to poor uptake of improved yam technologies (MoFA, 2019). The increased production has been attributed to the expansion of farm lands. Many studies have identified several factors that influence non-adoption of improved varieties in Ghana (Owusu & Donkor, 2012; Ragasa *et al*., 2013; Amengor *et al*., 2018; Acheampong *et al*., 2019). Factors normally enumerated to influence adoption are farmers' socio-demography characteristics (e.g., farmers' gender, age, education, farm size) and institutional factors (e.g., access to extension services, credit and infrastructure). Specifically, for yam production, Kenyon and Fowler (2000), in their study of factors affecting the uptake and adoption of outputs of crop protection research on yams in Ghana enumerated the many factors affecting the adoption of yam technologies in Ghana. These factors included characteristics of the technology (complexity, compatibility with existing practices, taste and cooking properties), characteristics of farmers' immediate environment (agro-climate, availability of information, access to complementary input) and characteristics of the farmer (education, age, gender).

Subsequently, a lot more, in terms of varietal development and agronomic improvements, have taken place in the yam subsector. However, till date, limited study has been carried out on the patterns of adoption of improved yam technologies in Ghana. The main objectives of this study were to measure the adoption rates of improved yam varieties and complementary agronomic practices produced by national research institutions and to find out about factors influencing adoptions. The study was intended to contribute to understanding factors affecting adoption of improved yam varieties to generate knowledge that would help design policy options to increase improved yam adoption and enhance the development of the yam industry in Ghana.

Materials and Methods

Study area

The study was conducted in all yam producing regions in Ghana where yam is produced in significant volumes. Figure 1 presents map of Ghana showing the study area. The study was conducted in 2016 when Ghana had ten regions.

A proportional probability sampling of districts was done, giving more weight to those with higher yam area and production. The regions and the districts selected fall within three major agro-ecological (Forest, transitional and Guinea Savannah) zones of Ghana. The southern regions comprising Ashanti, Brong Ahafo, Eastern, and Volta experience bimodal rainfall with mean minimum amount of 800mm to mean maximum rainfall of 2200 mm (MoFA, 2016). Mean annual temperature range from 24°C to 30°C. Upper West and Northern regions have unimodal rainfall with mean annual rainfall of 1100 mm and mean annual temperature of 25°C. These agro-ecological zones are noted for the production of maize, cowpea, and root crops (MoFA, 2016).

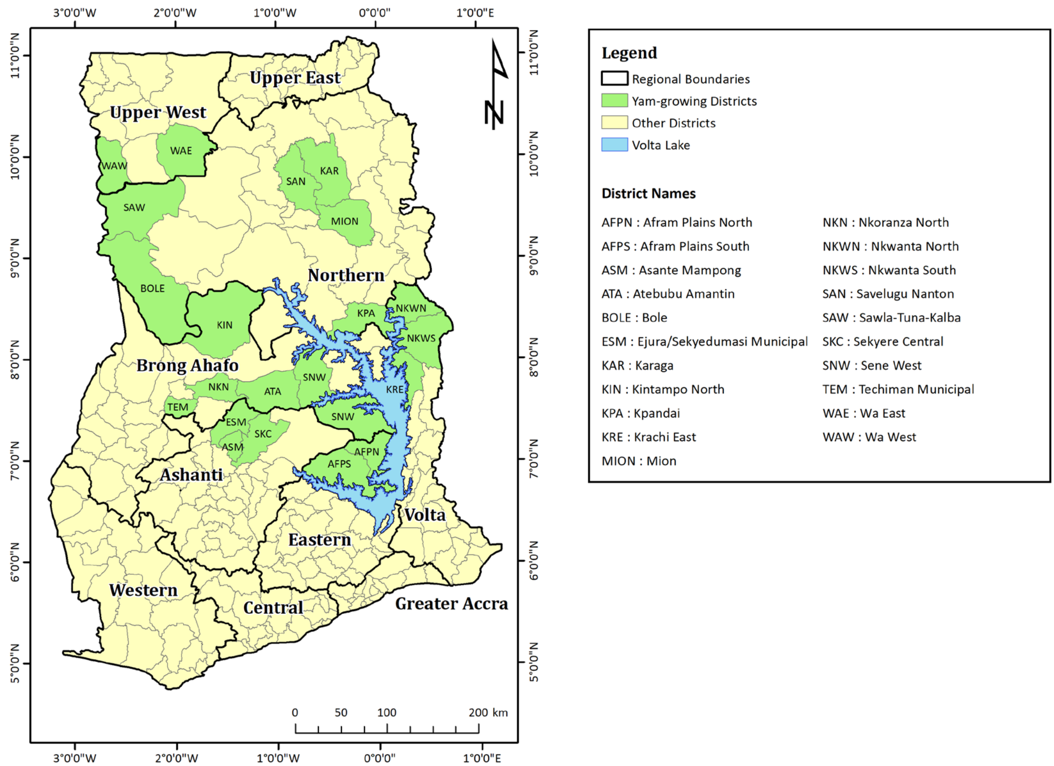

Fig. 1: Map of Ghana showing the study area

Sampling and data source and data collection
Multistage sampling technique was employed to sample the population for the study. The first stage involved the cluster sampling of yam districts within a selected region based on volumes of production. The second stage involved simple random sampling of the communities. All communities within the district were listed and through the lottery method the communities were selected. Finally, in the third stage, a simple random sampling

was again used to select the farmers. A total of 20 districts in seven regions across the country were visited. In each district, four communities that fall within an enumeration area were selected and seven farmers per community were randomly selected. These techniques were employed in order to increase percentage coverage and statistical accuracy and validity. Overall 560 yam farmers were randomly sampled. Due to incomplete information from 16 farmers, data from 544 farmers were used for the analysis

Data were collected through structured interview schedule administered to sampled yam farmers by trained enumerators. Before the actual survey, the structured interview schedule was pretested in non-sampled villages. This questionnaire pretesting was not only used to test the appropriateness of the tool in collecting the required data but also to evaluate the trained enumerators on the capability of administering the structured interview schedule. Information sought included membership of association and other social networks, farmer livestock ownership and control, saving and credit access, access to extension services and other information, income activities, yam technologies knowledge, perceptions and cultivation. Data collected were organized and analyzed using SPSS version 20 and STATA software version 14. The analyses were segregated based on agro-ecological zones and the statistics performed included frequencies, differences in means and regression analysis.

Analytical framework

Adoption of improved technologies in this study is defined as the use of any of the three *Dioscorea rotundata* (CRI-Pona, Makron Pona and Kukrupa) improved varieties that have been released since 2005 and disseminated among farmers over the past five years (2010-2016). Adoption was measured in terms of the number of persons who adopt the technology among the population of yam farmers (adoption rate) (Kaguongo *et al*., 2011). The logit regression model was used to determine the factors that influence farmers' adoption of improved yam varieties due to the dichotomous nature of the dependent variable. The reasoning for the use of the logit model is as a result of its ability to constrain the utility value of the decision to adopt variables to lie within 0 and 1 (Greene, 2003). Adoption of any of the three *Dioscorea rotundata* improved variety was captured as a dummy variable with the value of 1 assigned to that farmer and 0 for otherwise. Following Greene (2003), the binary logit for the two choice models can be written as;

$$y = 1 \quad if \quad y_i > 0 \quad adoption \qquad (1)$$

$$y = 0 \quad if \quad y_i \leq 0 \quad non-adoption \qquad (2)$$

Where y indicates adoption of individual farmer i

The probability that $y=1$ as a function of the independent variables:

$$p = pr\left[y = 1 \mid \mathrm{X}\right] = F(\mathrm{X}'\beta) \qquad (3)$$

Where X is a vector of explanatory variables, β is a vector of parameters to be estimated, F is the cumulative distribution function of the error term ε_{i1}. For the logit model $F(\mathrm{X}'\beta)$ the function is the cumulative distribution function of the standard normal distribution. The functional form of Eq. (3) is specified with the logit model as defined by as:

$$F(X'\beta) = \frac{\exp(X'\beta)}{1+\exp(X'\beta)} \qquad (4)$$

The specific empirical model for the determination of factors influencing improved yam variety adoption is given as:

Where y_i and ε_i represents individual farmer's adoption of improved yam variety and error term respectively.

Table 1 shows the description of variables used in the empirical modelling as well as related hypotheses.

$$y_i = \beta_0 + \beta_1 gender + \beta_2 age + \beta_3 education + \beta_4 \exp erience + \beta_5 farmsize + \beta_6 householdsize + \beta_7 association + \beta_8 dis\tan ce + \beta_9 extensionvisit + \beta_{10} awarenese + \beta_{11} plotowner + \varepsilon_i \quad (5)$$

TABLE 1

Description of variables used in the empirical model and hypotheses

Variable	*Definition and measurement of variables*	*Hypotheses*
Dependent variable		
Adoption	Dichotomous variable indication 1=Yes; 0=otherwise	
Independent variables		
Sex	Sex;1 if farmer is a male: 0 if farmer is a female	+-
Age	Age of farmer in years	-
Education	Number of years of formal education	+
Experience	Number of years in Yam farming	+
Household size	Number of persons in the household	+
Farm size	Total land holding in hectares	+
Association	If farmer is a member of association=1; 0=otherwise	+
Distance	Distance to input and output market in km	-
Extension Visit	Number of times of extension visit	+
Awareness	If farmer head has knowledge of improved varieties 0=otherwise	+
Plot owner	If farmer owns land=1 ; 0=otherwise	+

The adoption behaviour of farmers as shown in Table 1 is indicated from established adoption literature (Ghimire *et al.,* 2015; Langyintuo & Mekuria, 2005; Kassie *et al*., 2014). Sex is expected to influence adoption positively as male farmers are more likely to adopt new technologies due to access to resources such as land and credit. The influence of age on adoption may be mixed as both the old and the young are likely to adopt. The younger farmers may be eager to try new technologies and older farmers may be having more resources like land and finances to also try new technologies. Education and experience may influence adoption positively due to the ability to use their resources efficiently and enhances farmer's ability to obtain, analyze and interpret information. Household size is synonymous with labour availability and can influence adoption positively. Farm size is expected to have positive influence on adoption as farmers with larger farm sizes may be willing to use part to try new technologies.

Membership of association may affect adoption positively due to ability to information access. Distance to input and output market may have negative effect on adoption as longer distances discourage access to inputs and marketing of produce. Agricultural extension is the most efficient source of information of improved technologies to farmers and therefore extension visit is expected to influence adoption positively.

Results and Discussion

Socio-demographics of respondents

Table 2 shows the socio-demographic characteristics of respondents by agro-ecological zone. Majority (90%) of the yam farmers interviewed were males with just a few (10%) being females. Yam production has long been dominated by males (Martin *et al.,* 2013). The Forest zone had the highest proportion of female farmers (about 15%) followed by the Forest Transitional zone (about 11%). Majority of the farmers across the agro-ecological zones were married with Guinea Savannah zone recording the highest proportion of farmers that were married followed by transition and Forest zone.

TABLE 2

Socio-demographics characteristics of Yam farmers by agro-ecology

Variable	*Forest Zone (N=85)*	*Forest Transition (N=277)*	*Guinea Savannah (N=185*	*Pooled(N=544)*
Gender (%)				
Male	84.71	88.09	95.60	90.07
Female	15.29	11.91	4.40	9.93
Marital status (%)				
Single	7.06	4.69	3.85	4.78
Married	85.88	89.17	93.41	90.07
Divorced	1.88	2.53	1.10	1.84
Widowed	5.88	3.61	1.65	3.31
Residence status(%)				
Native	43.53	61.37	91.76	68.75
Settler	56.47	33.61	8.24	31.25
Level of education(%)				
None	34.12	55.23	76.92	59.19
Junior High	30.59	24.91	9.34	20.59
Senior High	31.76	16.25	12.64	17.46
Tertiary	3.53	2.53	1.10	2.21
University	0.00	1.03	0.00	0.55
Other descriptive statistics (Mean)				
Age (years)	49.10	47.74	41.71	45.60
Household size (count)	8.28	8.69	10.56	9.27
Experience (years)	25.33	21.43	22.14	21.99
Education (years)	7.10	3.80	2.64	3.94

Farm size(acres)	6.40	4.34	5.00	4.88

Again, majority (69%) of the farmers interviewed were natives of their respective settlements. By agro-ecological zone, Guinea Savannah had the highest proportion (92%) of farmers being natives followed by transition zone and then Forest zone respectively. Majority (59%) of the farmers interviewed had no formal education with farmers in the Guinea zone having majority (77%) with no formal education followed by transition zone of about 55%. The Forest zone had 32% and 31% of respondents attaining junior high school level and senior high school level of education respectively. Majority of respondents from Forest Transition and Guinea Savannah zones had not had formal education. Mean age of yam farmers was about 46 years with farmers from the forest zone having the highest mean age of 49 years followed by Forest Transition zone with a mean age of 47 years. Guinea Savannah zone had the youngest farmers with a mean age of 42 years.

Yam producers had been cultivating yam for quite long and had attained some appreciable level of experience in yam production. Mean experience in yam production was 22 years. Forest zone farmers were the most experienced with 25 years in farming. The mean farm size was about 5 acres (2 ha). Farmers in the forest zone had the largest farm size of 6.4 acres (2.56 ha). The Ministry of Food and Agriculture (2016) reports of average farm size of a Ghanaian farmer of about 2 hectares. This suggests that the farm sizes of yam farmers fall within the national average small farm size.

Adoption of improved varieties and good agronomic practices

Awareness and Adoption of improved yam varieties

Without farmers' knowledge of a new variety, the adoption possibility is impossible. Figure 2 presents the awareness level of respondents and their corresponding adoption of improved yam varieties by agro-ecological zones. The results showed that 50% of all yam farmers interviewed were aware of the three *Dioscorea rotundata* improved varieties. The forest zone had 87% of farmers who were aware of the three *Dioscorea rotundata* varieties followed by farmers in the Forest Transitional zone. Guinea Savannah zone had only 32% of farmers who were aware of the improved yam varieties. Adoption rate of the three improved *Dioscorea rotundata* varieties was 6.25% across the study area. About 13% of respondents from the Forest zone had adopted the varieties. Adoption of improved yam varieties across the yam belt (Nigeria, Benin, Ivory Coast and Ghana) of West Africa has been reported to be less than 10% (Mignouna *et al*., 2014). Therefore, the finding from this study corroborates with the general low adoption of improved yam varieties across West Africa. The results also showed where the awareness rate was high, for instance in the Forest Zone, the adoption rate was also high.

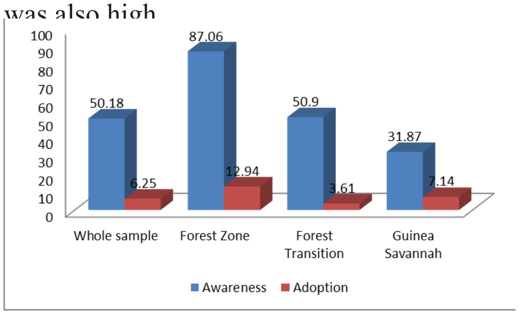

Fig. 2: Yam farmers' awareness and adoption rate of

improved yam varieties by agroecological zone

Table 3 shows the adoption spread of various improved yam varieties. *CRI-Pona* and *Mankrong-Pona* were the two most popular improved varieties cultivated by farmers. About 9% of the farmers interviewed grew *CRI-Pona* in the Forest zone followed by about 1% at the Forest Transition zone and 0.55% at the Guinea Savannah zone. *Makrong-pona* was cultivated by 6% of farmers from the Guinea Savannah zone and only 1% of farmers from the forest and the transition zones. Few farmers from Forest Transition and Guinea Savannah zones cultivated *Agric variety* (improved varieties that farmers could not name) The indigenous varieties were mostly grown in all the ecological zones.

TABLE 3

Adoption of improved yam varieties by agro-ecological zones, 2016 major season

Varieties	*Forest Zone (N=85)*	*Transition Zone(N=277)*	*Guinea Savannah Zone (N=182)*	*All Zone (N=544)*
CRI-Pona	9.41	1.08	0.55	2.21
Mankrong-Pona	1.18	1.44	6.04	2.94
Agric	0.00	0.36	0.55	0.37
Indigenous	89.41	97.11	85.71	94.49

Adoption intensity of improved yam varieties

The intensity of adoption was estimated by the proportion of yam plots that were devoted to the cultivation of improved yam varieties. Table 4 shows the area of cultivation of the various improved yam varieties during the 2016 major season. Just about 2.9% and 2.8% each of the total yam area were put to the cultivation of *Mankrong-Pona* and *CRI-Pona* respectively. *Agric variety* covered about 0.2% of the total yam area of the country. The *indigenous* varieties covered 94% of the yam area in Ghana.

TABLE 4

Area planted to specific yam varieties in 2016 major season

Variety	*Area(ha)*	*Total (%)*
Improved variety		
CRI-Pona	48.00	2.82
Makrong-Pona	50.00	2.94
Agric/MoFA	3.22	0.19
All improved variety	101.00	5.95
Indigenous variety		
Indigenous variety	1598.50	94.05
Total area of yam	1699.5	100.00

Awareness and Adoption of agronomic practices

Many improved agronomic practices have been introduced to farmers. They are mainly used in addition to the improved yam varieties for them to exhibit their potential. Farmer awareness and adoption of these technologies were sought. Figure 3 presents the knowledge and use of recommended agronomic practices by yam farmers across the region.

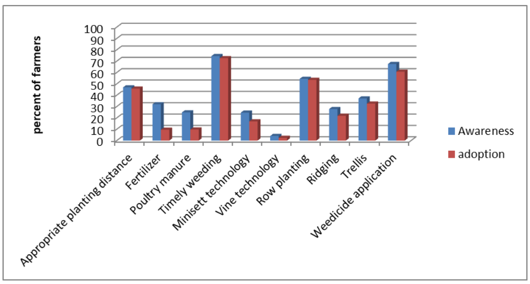

Fig. 3: Adoption of improved yam agronomic technologies (N=544)

The descriptive statistics showed that 46% of respondents were aware of appropriate planting distance of 1m by 1 m for maximum plant population and 46% said they planted at that distance in 2016 major season. The rate of awareness of fertilizer application on yam fields was 32% and 9% reported using fertilizers. With timely control of weed, out of the 74% of the farmers that had knowledge of it quite an appreciable number (73%) said they controlled weeds on time. About 61% out of the 67% of the farmers that had knowledge of weedicides applied it on their yam fields. Regarding row planting out of the 54% of farmers that had knowledge of it, 53% applied row planting. On ridging 27% of farmers were aware and 21% had adopted it. With minisett technology (cutting seed yams into pieces of 30 to 50 g) (IITA, 1985), 24% of respondents said they were aware of it and 16% reported that they had adopted it. Yam minisett technology was developed in the 1980s and has been introduced to farmers over many years (IITA, 2004). The low knowledge and low rate of adoption is very surprising. Nonetheless, many authors (Kambaska *et al.,* 2009; Ajieh, 2012) have bemoaned the low adoption of minisett technology despite being the most effective method for rapid multiplication of seed yam for increased and sustained production of the crop. Vine technology (tuber-less yam propagation technique where yam is propagated through vine cuttings using carbonized rice husks as growth medium) (Otoo *et al.,* 2016) was recently introduced to farmers. Only 4% reported having knowledge of it and 2% said they practiced it.

Factors affecting adoption of improved yam varieties

Mean differences between adopters and non-adopters were analyzed and the results are presented in Table 5. Mean difference between the age of adopters and non-adopters was four years and it was significant. Adopters were older than non-adopters suggesting that adopters might be more experienced and more resourceful in terms of land and funds to try out new varieties. Concerning experience in farming, the mean difference between adopters and non-adopters was significant. Adopters had more experience in yam farming than non-adopters.

Farmers who did not grow improved yam varieties (non-adopters) were significantly better educated than the adopters by having about two additional years of schooling on average. The less educated may have been the target of extension officers. Similar findings were reported in Tanzania on adoption of improved wheat (Mussei *et al.,* 2001). As regards awareness, the mean difference between adopters and non-adopters was significant. Adopters were more aware of the improved yam varieties than non-adopters.

The distance to input and output market was significantly shorter for adopters than non-adopters. The result here supports the assertion that adopters of improved varieties are nearer to input and output market. Input and output markets influence the adoption of improved agricultural technologies. The further away a village or a farmer is from input and output markets, the lesser the likelihood that they will adopt high yielding technology.

TABLE 5

Mean differences between adopters and non-adopters of improved yam varieties

Variable	*Adopters (N=34) (6.25)*	*Non-adopters (N=510) (92.46%)*	*Diff.*	*t-stats*	χ^2
Socio-demographics					
Sex					
Male	0.83	0.91			2.42
Female	0.17	0.09			
Household size	9.82	9.19	0.63	0.76	
Age	49.94	45.63	4.02**	1.93	
Experience	24.14	20.57	3.57*	1.71	
Education	2.29	4.08	1.79**	2.14	
Association	0.63	0.53	0.09	1.20	
Farm characteristics					
Farm Size	5.61	4.83	0.77	0.25	
Plot Owner	0.73	0.76	0.03	0.51	
Institutional factors					
Extension access					
Yes	0.21	0.78			0.003
No	0.79	0.22			
Extension visit	2.92	2.84	0.07	0.23	
Awareness					
Yes	0.88	0.49			19.05***
No	0.12	0.51			
Distance	9.92	13.68	3.75*	1.76	

***significant at 1%; ** significant at 5%; ***significant at 10%

The logit estimates of the factors influencing adoption of improved yam varieties are presented in table 6. The pseudo R-squared which is explained as the variance in the dependent variable that is predictable from the independent variables is 0.16. McFadden (1974), opined that a value of 0.2-0.4 indicates excellent model fit, thus the logit model presented has quite a good fit. The results revealed that years of education negatively and significantly influenced the adoption of improved yam varieties. The implication is that the probability of adoption is more likely with those who have not spent many years in school. These yam farmers from the descriptive results were older and more experienced and probably more resourceful to try new technology that would give them higher yields than what they had. The result is consistent with many (Uematsu, 2010: Tesfaye *et al*., 2016) adoption studies that found negative effect of years of education on adoption.

TABLE 6

Logit estimates of factors influencing the adoption of improved yam varieties

Variable	*Coefficient*	*Std. Err.*
Age	0.009	0.019
Education	-0.100***	0.042
Household size	0.018	0.034
Experience	0.010	0.019
Farm Size	0.003	0.009
Distance	-0.036*	0.022
Gender	-0.392	0.568
Marital Status	-0.151	0.597
Association	0.423	0.376
Awareness	2.410***	0.557
Plot Owner	0.062	0.395
Extension	-0.789**	0.430
Extension Visit	-0.023	0.086
Constant	-3.550***	1.192
Observations	544	
Pseudo R-Squared	0.16	
Log Likelihood	-121.24	

*significant at 10%, **significant at 5%, *** significant at 1%

Improved varieties awareness is positive and significant at 1%. The probability of adoption increases with increased awareness. The importance of information cannot be underestimated in the adoption process. The importance of awareness in agricultural technology adoption has been suggested by many studies in Africa (Kaliba *et al.,* 2000; Shiferaw *et al.,* 2008) and these findings corroborate with the findings in this study. Also, increased understanding of the benefits of technology increases probability of adoption as it reduces fear of participation. The coefficient of extension access was negative and significant contrary to expectation. This indicates that farmers receiving visits by extension are less inclined to the adoption of improved yam varieties. This suggests that extension workers may not be recommending improved yam varieties, which may be through lack of knowledge of the technologies by the extension agents. It may also imply that farmers are dismissing the information given by extension workers concerning improved yam technologies. The coefficient of distance was negative and significant, suggesting that shorter distances to input and output market are important to adoption of improved yam varieties. The probability of adoption is more likely with farmers who travel short distances to access market. Yam is very bulky and has short shelf life and so the ability to access market conveniently serves as incentive to adopting new varieties which are supposed to give more yields. Udoh and Kormawa (2009**),** analyzed the determinants for cassava production expansion in the semi-arid zone of West Africa and found out that distance to nearby urban markets was a major influence on cassava adoption in Ghana, Chad, Nigeria, Burkina Faso.

Conclusion and Recommendations

The study has assessed adoption rates of improved technologies of yam and factors influencing adoption. The results revealed that the overall adoption rate was 6%. The adoption rate in the Forest zone was 13%, that in the Forest Transition was about 4% and the rate in the Guinea savannah zone was 7%. Adoption rates of improved yam varieties are low in Ghana. The awareness rate of 50% was also low suggesting that low adoption may be due to low awareness of the improved varieties and complementary agronomic practices. Pursuing awareness creation by extension across yam producing areas is important to encourage adoption.

The results revealed that the probability of yam adoption is significantly affected by awareness, distance to input and output market, extension and years of education. It was revealed that awareness affected adoption of improved yam varieties positively and significantly at 1%. The importance of awareness creation cannot be underestimated in adoption process. Research institutions and extension should be resourced to conduct demonstrations and organize field schools to increase awareness for increased adoption. Distance to input and output market appeared to influence adoption negatively. Shorter distance to market means that produce gets to marketers on time avoiding product deterioration and also reducing transportation cost. Government and private sector should create an enabling environment such as improving road networks and providing infrastructure for smallholder producers to get better access to markets to reliably sell their produce at the required prices. This in turn will encourage farmers to cultivate high yielding yam varieties to increase the quantity of produce.

The results also point to negative impacts of extension contact on adoption of improved yam varieties. This unusual expectation means that extension provision on improved yam technologies is lacking. Either the extension agents are not well educated on the improved technologies of yam or they are biased towards the existing technologies of yam. Agricultural extension agents need training on new technologies to enable the impact of knowledge acquired to farmers. There is a need for the government to strengthen research-extension linkage by providing funding for capacity building.

Since this study could not capture other data needs such as technology characteristics (eg complexity, compatibility with existing practices, taste and cooking properties) and cost of technology, further studies to fill these data gaps are recommended.

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