

Adoption Potential of Improved Sweetpotato Varieties in Ghana

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Abstract

Root and tuber crops are essential staple crops produced in the West African sub-Region. The West African Agricultural Productivity Programme (WAAPP) funded by the World Bank seeks to improve root and tuber crops to ensure increased productivity, food security and poverty alleviation. The first phase ended with the release of four improved sweetpotato varieties (Ligri, Bohye, Dadanyuie, Patron) with higher productivity compared to other existing varieties. Potential adoption study is necessary to aid dissemination of the varieties by identifying varietal traits that could drive the adoption and varietal choices across various locations. The study employed qualitative approach (Participatory Rural Appraisal) involving 126 farmers randomly selected from a purposive pool of sweetpotato farmers from four major sweetpotato growing areas (Akatsi, Komenda, Ohawu and Asempanaye) in the Volta and Central regions of Ghana. Males (59.6%) dominated in sweetpotato production across location and a youth representation of 40% of the total sampled size which is a good indication for sweetpotato production. Sweetpotato production is undertaken mostly in the minor season (August-September) on an average farm size of 1.5 acres (0.6 ha) using both local and improved varieties (Sauti, Santom pona, Faara and Apomuden). Farmers perceived major pests that affected the crop to be Sweetpotato weevil (50% yield loss), Grasshoppers (30% yield loss) and Caterpillar (20% yield loss). Pesticides (Actelic 50 EC) was extensively used in pest control. Farmers perceived that, excessive use of pesticides had a negative effect on the sweetpotato yield and quality. Mean yield per hectare was 3.3 tons (3300 kg). Based on major and minor season prices, the highest profit was made in the minor season. Mean total production cost per hectare was GHC1,925.00 in the major season and GHC2,812.50 in the minor season; Revenues obtained were GHC4,050.00 and GHC6,600.00 and Gross Margins of GHC2,125.00 and GHC3,787.50 in the major and minor seasons respectively. Considering on absolute percentages, Komenda preferred variety Dadanyuie (85%) and Patron (62%); Ohawu preferred Bohye (85%) and Dadanyuie (76%), Asempanaye preferred Patron (76%) and Bohye (70%); Akatsi farmers preferred Dadanyuie (76%) and Bohye (61%) based on the varietal characteristics deemed ideal for farming conditions, increasing output and subsequently income. Optimum adoption of a new variety requires the consideration of locational variety choices, training on good agricultural practices, education on the traits of the new variety and proper marketing techniques.

Keywords: Sweetpotato, Gross Margin, Varietal Choices, Adoption Potential

L'adoption Potentiel des variétés améliorées de patates douces au Ghana

Résumé

Les cultures de racines et tubercules sont des cultures de base essentielles produites dans la sous région de l'Afrique de l'Ouest. Le Programme de Productivité Agricole de l'Afrique de l'Ouest (PPAAO) financée par la Banque mondiale vise à améliorer les racines et les tubercules pour assurer une productivité accrue, une sécurité alimentaire et une réduction de la pauvreté. La première phase s'est terminée par le développement de 4 variétés de patates douces améliorées ('Ligri', 'Bohye', 'Dadanyuie', 'Patron') avec une productivité plus élevée par rapport aux autres variétés qui existent. Une étude d'adoption potentielle est nécessaire pour faciliter la diffusion des variétés en identifiant les traits variétaux qui pourraient contribuer à l'adoption et les choix variétaux dans divers endroits. L'étude a utilisé une approche qualitative (évaluation participative rurale) impliquant 126 agriculteurs sélectionnés au hasard parmi un groupe de cultivateurs de patate douce de quatre grandes zones de culture de la patate douce (Akatsi, Komenda, Ohawu et Asempanaye). Les hommes (59,6%) ont dominé la production de la patate douce à travers l'emplacement et une représentation des jeunes de 40% de la taille totale de l'échantillon, ce qui constitue une bonne indication pour la production de la patate douce. La production de la patate douce est plus faite dans la saison secondaire (août-septembre) sur une superficie moyenne de 1,5 hectare (0,6 ha) en utilisant des variétés locales et améliorées (Sauti, Santom pona, Faara et Apomuden). Les ravageurs majeurs qui ont affecté les cultures étaient le charançon de la patate douce (50% de perte de rendement), les sauterelles (30% de perte de rendement) et Caterpillar (20% de perte de rendement). Les pesticides (Acetelic 50EC) ont été largement utilisés dans la lutte antiparasitaire. Les agriculteurs ont perçu que l'utilisation excessive de pesticides avait un effet négatif sur le rendement et la qualité de la patate douce. Le rendement moyen par hectare était de 3,3 tonnes (3000 kg). Sur la base des prix de la saison majeure et de la saison secondaire, le bénéfice le plus élevé a été effectué dans la saison secondaire. Le coût total moyen par hectare était GH C 1,925.00 dans la saison majeure et GH C 2,1212.50 en saison secondaire; Les revenus obtenus ont été GH C 4,050.00 et GH C 6,600.00 et la marge brute étaient GH C 2,125.00 et GH C 3 787.50 respectivement. Komenda a préféré la variété Dadanyuie (85%) et Patron (62%); Ohawu préférait Bohye (85%) et Dadanyuie (76%), Asempanaye préférait Patron (76%) et Bohye (70%); Les agriculteurs d'Akatsi préféraient Dadanyuie (76%) et Bohye (61%) en fonction des caractéristiques variétales jugées idéales pour les conditions d'élevage, augmentant la production et par la suite les revenus. L'adoption optimale d'une nouvelle variété nécessite l'examen des choix de variété de localisation, la formation sur les bonnes pratiques agricoles, l'éducation sur les traits de la nouvelle variété et les techniques de marketing appropriées.

Mots-clés: La patate douce, marge brute, choix variétaux, l'adoption potentiel

Introduction

In a study on agricultural technology, Beale and Bolen (1955) emphasized that awareness of a technology was important in adoption. Nowak and Korsching (1998) also stated that ignoring the creation of awareness was responsible for poor predictive power in binary analytical models in adoption studies. The primary stage in new technology introduction is to make farmers aware of the technology through demonstrations and workshops among others for farmers to adopt if they find it productive technically and economically. Diagne and Demont (2007) concluded that, in determining potential adoption rates if technology awareness is left out, the end result would be inconclusive.

The fact that root and tuber crops are essential staple crops in the West African Sub Region cannot be over emphasized. The West African Agricultural Productivity Programme I (WAAPP I) was a World Bank funded project that sought to improve root and tuber crops to ensure increased productivity and food security as well as poverty alleviation. The first phase (2008-2013) ended with the released of four improved sweetpotato varieties (Ligri, Bohye, Dadanyuie, Patron) with higher productivities compared to other existing varieties. It was essential to undertake a potential adoption study of the four improved varieties as an aid to dissemination of the varieties. This study therefore aimed to identify traits that could drive the adoption of the new varieties and the varietal choices across various locations.

Materials and Methods

The study used qualitative approach in collecting and analyzing data using the Participatory Rapid Appraisal (PRA). PRA is a collection of methods that enable individuals to share and assess their local knowledge, thereby allowing them to plan and to act (Chambers, 1994), with outsiders facilitating

rather than controlling the process (World Bank, 1994). Tools developed and used in this process facilitate the collection and analysis of information by and for community members, with an emphasis on local knowledge. Outsiders are therefore able to access information to understand how the community uses and manages its resources. It therefore provides a platform for soliciting informal and unbiased information with the community members and with a variety of stakeholders. One is able to identify existing practices, problems, conflicts, and opportunities regarding the concept under review (Asia Forest Network, 2002). It was structured in two sections namely the Reconnaissance Workshop and the community level discussion.

The workshop was organized for extension officers who were in contact with sweetpotato farmers. The aim was to identify the bottlenecks and successes in sweetpotato production and marketing in the study area. It also served as the bases for designing the checklist for the community level discussions. Eight extension officers participated in the workshop and assisted with the information gathering process consisting of 62.5% Males 37.5% Females. The youth representation was 75% of total participants.

The community level discussion was further undertaken using the Participatory Rapid Appraisal (PRA) approach. Farmers and Researchers constituted the team for the discussions. Based on challenges outlined a check list was developed for the community level discussions. Respondents were guided using the checklist developed at the workshop to respond to pertinent issues in sweetpotato production and marketing. The discussions involved 96 farmers randomly selected from a list of sweetpotato farmers from four major sweetpotato growing areas namely Akatsi, Komenda, Ohawu and Asempanaye. Four

Participatory Rural Appraisal sessions were conducted in Komenda (32), Ohawu (27), Asempanaye (32) and Akatsi (32) with an average of 24 farmers per location.

Results and Discussions

Reconnaissance Workshop

Prominent problems identified were difficulty of farmers in identifying sweetpotato varieties they grow by their correct names. Some name them based on their appearance. Others also, named them after the farmer from whom they got the vine and/or the officer who introduced them to the variety. Dao *et al.* (2015) records that farmers name maize varieties in their own dialect based on one or a number of unique features and this could be the case of a single variety for as long as 15 years.

Other challenges were low profits due to high perishability of sweetpotato roots, lack of accurate information by extension officers and lack of proper storage facilities. Pest and disease infestation also remains a major threat to sweetpotato production. Sagringa (2015) elucidated these constraints among others as major dip points in roots and tubers production in the West African Sub Region. The constraints identified by the stakeholders, is a fair reflection of the general perception in Ghana and Sub-Saharan Africa.

Community level discussion using Participatory Rapid Appraisal

Gender: Across the location as indicated in Figure 1, male farmers dominated in sweetpotato production. Ayamba (1999) and (Zakaria *et al.*, 1998) emphasized this and the reason was because most women chose to do something else as an insurance should their male counterparts agriculture venture fail coupled with the preference that Ghanaian women have trading in agriculture products as against crop production (Obosu-Mensah, 1999). However, in Asempanaye the females

were more than the males. The latter was due to the fact that most of the male farmers were focusing more of their production efforts at cultivating other crops because they are of the perception that sweetpotato production is less involving, hence are best managed by female farmers. It is worth noting that, generally, respondents are of the perception that, men cultivated more of the crop than women.

Youth representation across location was about 40% of the total sample which is a good indication for future sweetpotato production. The youth has been described as bed rock for economic prosperity in the future provided relevant interventions are implemented (Ashford, 2007). However the percentage of the youth participating in agriculture is inadequate (Mangal, 2009). The national youth contribution to employment in Ghana is about 34.1% and a youth representation in agriculture of about 41.6% (GLSS6, 2014) indicating that the outcome of this study is in line with the Statistical Services estimation of the share of the youth in agriculture.

Crops cultivation: There were two main seasons of cultivation. These were the major season (April July) and the minor season (August October). Major season cultivation was mostly on the highlands due to excessive rain which created waterlogged conditions on the lowlands. Farmers who cultivated sweetpotato in the major season were very few because most of the arable lands are used for the cultivation of other crops such as maize, cowpea and cassava. In the minor season however, the number of farmers who cultivated sweetpotato increased because the land was available and the volume of rainfall was adequate for sweetpotato cultivation. Other crops grown in both major and minor seasons included watermelon, tomatoes, pepper, okra, and garden eggs, onion, cucumber, beans and groundnut. The average sweetpotato farm size across location was 0.6

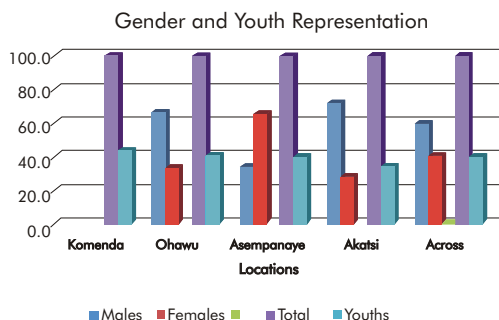


Figure 1: Gender Representation of Respondents

ha. The varieties grown are mostly local varieties. However, farmers in Komenda, Ohawu and Akatsi were aware of the existence of the improved sweetpotato varieties and were cultivating a few such as *Sauti*, *Santom pona*, *Faara* and *Apomuden*. Farmers in Asempanaye had not heard of any improved variety, so they were growing none of the improved varieties.

The Production Processes: Production practices were virtually the same across location with minimal variations across location. In general, production involved the

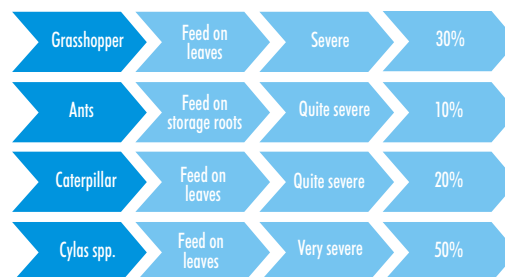


Figure 2: Farmers' Perception about Pest Infestation

following processes; acquisition of land (i.e. if you don't have your own land), herbicide application, land clearing (either manual or mechanical), preparation of mounds or ridges (mounds were mostly preferred by farmers with the believe that the aeration on ridges was minimal), planting of vines (at 3 to 4 cm nodes long per cutting), first weeding [manual], pesticide application (in case of pest attacks), second weeding and vine control [manual] and harvesting.

Farmers' Perception on Pest Infestations on their fields: Major pests that affected the crops were grasshoppers and caterpillars and these

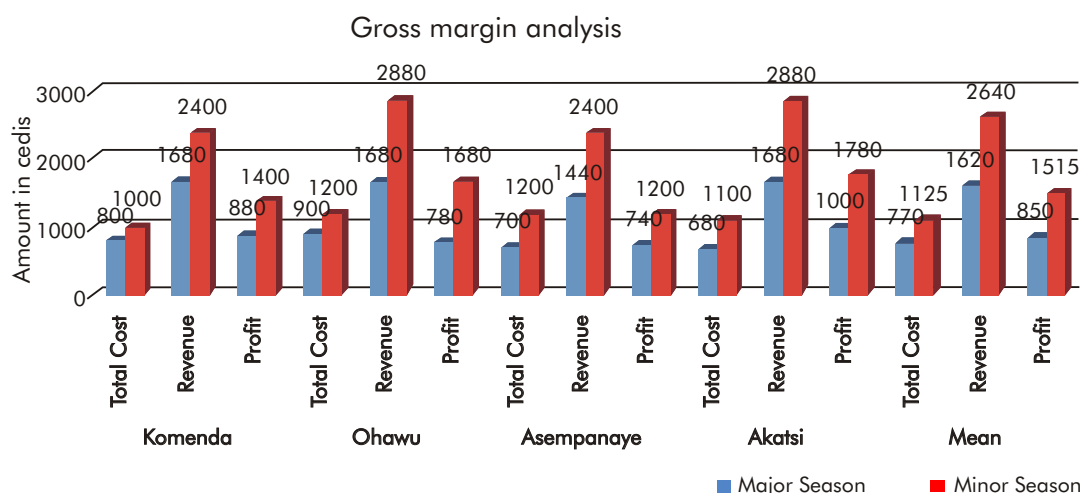


Figure 3: Profitability Analysis of Sweetpotato Production (GH¢1=USD4.22- www.xe.com)

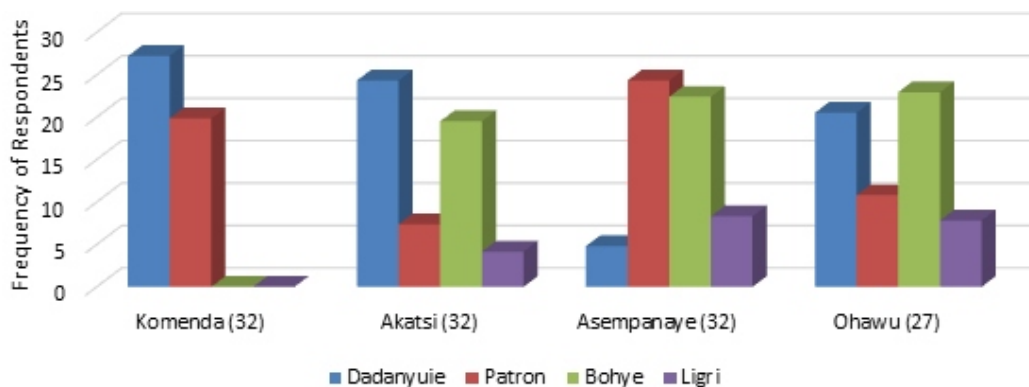


Figure 4: Farmers, preferences for Improved Sweetpotato Varieties

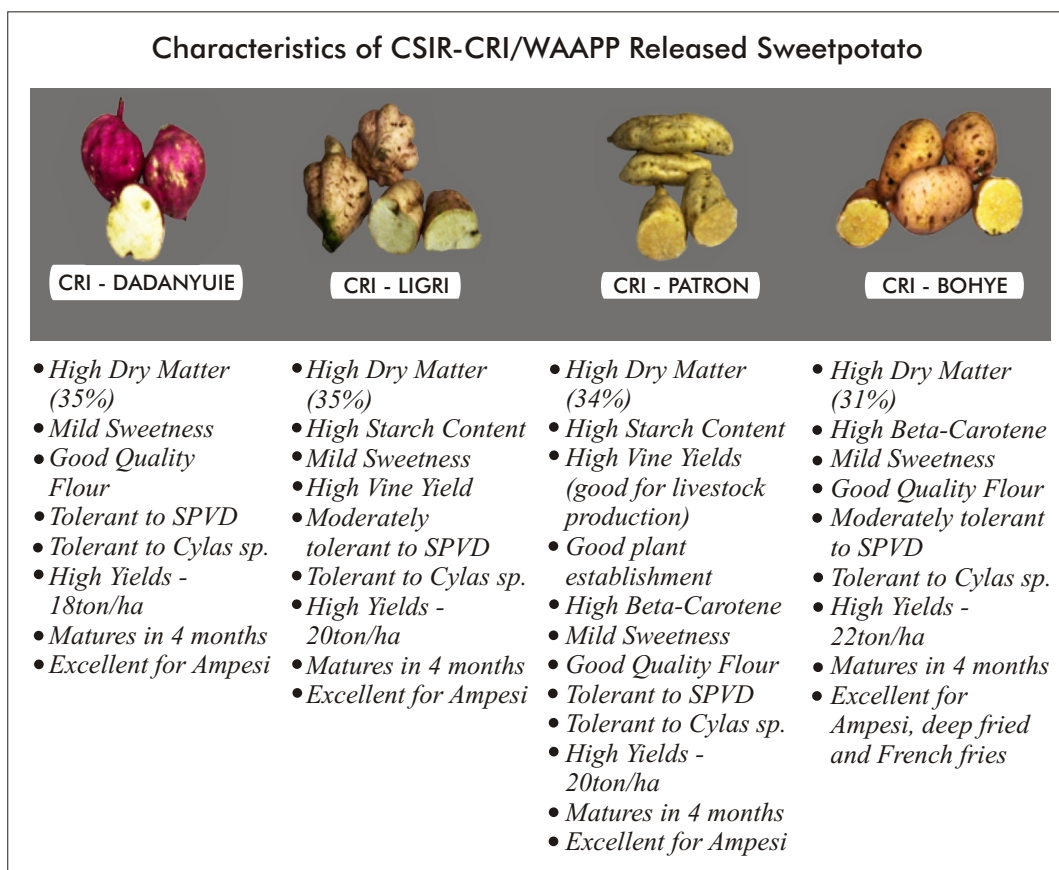


Figure 5: Characteristics of WAAPP/CSIR Improved Sweetpotato Varieties
Source: CSIR - Crops Research Institute

were outlined by Ames (1997) in a publication on sweetpotato insect pest, diseases and nutritional disorders. Respondents alluded to the fact that the grasshoppers fed on leaves while the caterpillars bore holes into the matured tubers. The most severe effect was caused by the *Cylas* spp. that reduced yield and quality with an average yield loss of 50% as indicated in Figure 2. However, the damage was more pronounced in the minor season where the soil and environmental conditions were conducive for their growth. In controlling these pests, both physical and chemical methods were employed. In physical control, farmers allowed natural occurrences such as rains to control the pests. Farmers also applied pesticides such as Actellic 50EC in controlling the pest. Farmers perceived that, the excessive use of any chemical had negative effects on the sweetpotato yield and quality and storability. Source: Field Study, 2015

Gross Margin Analysis: Profitability of an agricultural venture plays a key role in farmers' decision making aside natural ecology and environmental determinants (Upton, 1996). In that regards a farmer may continue the commercial cultivation of a crop only when it yields positive returns except it is grown basically for the direct consumption of the farmer's household (Burpee and Wilson, 2014). On the average, across location, total yield per acre was 1.2 tons (1200 kg). Considering the selling prices at the various locations in both the major and minor seasons, the highest profit was made in the minor season and the lowest in the major season. This was because the market value of sweetpotato increased in the minor season due to its high dry matter content. On the average, it was GHC770.00 (USD182.90) per hectare in the major season and GHC1,125.00 (USD 267.22) per hectare in the minor season. Revenue followed a similar trend with major season revenue (GHC1,620.00) per hectare, trailing behind that of the minor season

(GHC2,640.00) by GHC1,020.00 (USD 242.28). It is obvious that with all the challenges in sweetpotato production, it still remains profitable with GHC850.00 (USD 201.90) in the major season and GHC 1515.00 (USD 267.22) in the minor season. According to Dai (2013), sweetpotato farmers in southern Ghana, Nigeria and Burkina Faso had profits of USD 677.00, USD136.00 and USD366.00 respectively. By implication farmers in the area under consideration are earning lesser than their counterparts in Southern Ghana and Burkina Faso but doing better than that of Nigeria. There is more prospect for the sweetpotato farmers in the study area to exploit in maximizing gains from production.

Varietal Preferences: The desire to grow a particular variety is propelled by the farmers' needs and expectations. The characteristics farmers looked out for in adopting a new variety included early maturing, high yielding, and pest and disease tolerance, good taste, good colour and marketability. This is emphasized by Dao (2015) in an observation that, maize farmers looked out for early maturing, drought tolerant and disease tolerant varieties but most importantly the yield potential drove farmers' adoption most. Respondents were therefore introduced to the four identified varieties (Patron, Ligri, Bohye and Dadanyuie) in terms of appearance, yields, dry matter content, starch content, sweetness, vine yield, tolerance to pest and disease, maturity period and suitability for ampesi. It is worth noting that, respondents were not privy to the names of the varieties during the exercise. The varieties were not considered in relation to each other but in absolute terms. The results for each variety is expressed individually as a percentage of the total sample size per location.

In Komenda farmers preference among the WAAPP/CSIR-CRI varieties were

Dadanyuie (85%) and Patron (62%), Ohawu farmers preferred Bohye (85%) and Dadanyuie (76%), Asempanaye farmers preferred Patron (76%) and Bohye(70%); Akatsi farmers preferred Dadanyuie (76%) and Bohye (61%). Refer to figure 4. Farmers' indication was based on varietal characteristics that found ideal for their farming conditions and could help in increasing output and subsequently income. Attributes of the said varieties are outlined in Figure 5.

Conclusion

Based on the above findings, the following recommendations are vital:

- Variety choice for the various locations should be taken into consideration during dissemination of varieties.
- There is the need to replicate the study across the various ecological zones to identify which of the four varieties is preferred by farmers and other stakeholders in the sweetpotato value chain.
- There is the need to train farmers on good agricultural practices with respect to the new varieties and educate them well on their characteristics and their names.
- Extension officers need to be equipped with the requisite knowledge to play their roles as the link between farmers and researchers.
- Farmers and traders should be educated on proper marketing procedures to help in making gains from production and trade sustainably.
- Innovation platform approach to dealing with issues should be encouraged so that collectively actors would complement each other in mitigating the bottlenecks in sweetpotato value chain.

The results of the study confirmed that, careful considerations needed to be given to awareness as well as characteristics of a given variety in order to enhance the adoption of a given sweetpotato variety. It will provide

useful information to researchers for developing appropriate dissemination strategy for enhancing sweetpotato adoption for increased productivity.

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