

Structure of Cocoa Based Vegetable Seed System for Selected Locale in Ghana

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Abstract

The vegetable seed industry in Ghana is still at its formative stages. Farmer access to quality improved seed is still a daunting challenge. As a response, very few improved vegetable lines have been evaluated and tested in the country for dissemination to farmers. Using multistage sampling, a total of 137 vegetable farmers in the Offinso South municipal of the Ashanti region of Ghana were interviewed using structured questionnaires to characterize vegetable seed supply and distribution system. Results from the study indicated 45.3% of respondents acquired seed from commercial seed growers. Farmer saved seed accounted for 37.2% of sampled respondents while 32.1% of respondents sourced seeds from other farmers. The role of the formal seed system through private seed companies was minimal (10.2%). Only 10.9% of respondents treated their seeds before storage with 38.7% of respondents doing so prior to planting. This led to 23% of seed loss in storage with some farmers losing as much as 100%. The development of a vibrant vegetable seed system will require strong actor linkages within the seed supply chain to identify solutions to critical bottlenecks. An enabling policy environment for establishing dynamic and operational private seed companies, is a critical determinant of success in targeted farming communities. Provision of cold room facilities will also be necessary to ensure seeds are well stored.

Keywords: cocoa-based farming systems, crop diversification, vegetable seed, seed policy, Offinso South

1. Introduction

Vegetables are increasingly becoming an important commodity for both domestic and export markets. They have great potential to improve nutrition and health of consumers as most of them, particularly traditional species are good sources of vitamins, minerals and proteins needed for the proper functioning and development of the human body (Wills *et al.*, 1998). Despite the nutritional importance of vegetables and their high farm gate values per unit area for generating employment and income (Weiberger and Lumpkin, 2007), the sub sector is faced with a myriad of challenges. The importance of seed to any crop-based production system cannot be overemphasized since it is the fundamental unit of any production system (Etwire *et al.*; 2013). High-quality seed in particular is fundamental to enhancing agricultural productivity, increasing food security and improving rural livelihoods (Kuhlmann & Zhou, 2016).

Access to quality seed is one of the major production challenges in Ghana. The seed industry in Ghana is still at its formative stage with access to improved seed constituting a huge challenge for many smallholder producers. Very few improved vegetable lines have been evaluated and tested in the country for dissemination to farmers. Seed companies are also limited and spatially located far from most producers, especially in rural communities. Weak linkages exist between vegetable producers and actors of the supply chain preventing access to quality seed for production. Information on the seed industry is limited which affects investments to the industry. This paper therefore provides an insight to the local vegetable seed system in terms of its dynamics and how to strengthen it for improved productivity. Critical attention is given to seed source, source of information, use of certified seeds, practice of seed storage and testing.

2. Materials, Area Description and Techniques

This study was undertaken in the Offinso South municipal district in the Ashanti region of Ghana. The district lies between longitudes 10° 50' W and 10° 45' E and latitudes 7° 20' N and 6° 50' S. The total land area is about

741 kilometers square. The municipal shares boundaries with the Offinso North District Assembly in the North, Ahafo Ano South District Assembly in the West and Afigya Skyere District Assembly in the East, Atiwma Nwabiagya District Assembly and Kawbre District Assembly in the South. Using multistage sampling technique, 137 vegetable producers who cultivate various crops including cabbage, okra, tomatoes, garden eggs and leafy vegetables within a predominantly cocoa based system were randomly sampled for the study. The first stage was the purposive selection of Offinso South Municipal where the AVRDC cocoa based vegetable project was been implemented. The second stage was the purposive sampling of communities involve in the project with the last stage been the random selection of farmers from project communities. Sampled farmers were interviewed with the aid of a structured questionnaire. Data generated included source of seed, practice of seed treatment, seed storage, sources of information on seed and role of actors in the seed supply chain. Data was analysed using descriptive statistics and inferential graphs.

3. Results and Discussions

The Ghana seed system is a hybrid of the formal and informal system with scanty information (Etwire et al., 2013). Two main segments of the system are the formal and informal seed systems. The formal seed system is well structured and coordinated by governmental agencies such as the research institutions and the Ministry of Food and Agriculture (MoFA). The Plant Protection and Regulatory Directorate of MoFA is the responsible directorate for monitoring and certifying seed development and multiplication. It does this through its seed inspection and certification division.

Breeding and variety development in the country is carried out by research institutions under the Council for Scientific and Industrial Research (CSIR) in collaboration with other international partners. The Universities in the country also develop and test varieties leading to seed development. New variety development requires the institutions with the requisite mandate to go through a vigorous process of gene identification, crosses and or use of biotechnology, setting up of on-station and on farm trials and several years of multi location trials. Economic analysis is carried out prior to the release of a variety to ascertain the economic viability or otherwise to farmers in reducing either cost of production or enhanced yields for higher incomes.

Multiplication and distribution of seed is through the formal and informal seed system. With regards to the formal system, research institutions and the universities develop the breeder and foundation seeds. Breeder seeds are passed on to MoFA for multiplication and production of foundation seed. Foundation seed gets to seed companies and seed producers to produce certified seed. Farmers access certified seed from seed companies and seed producers.

Due to the weak linkages and poor financing of the formal seed system, the role of the informal seed system cannot be over emphasized. Farmers often recycle their own seeds from their harvest. Use of farmer saved seed typically leads to high incidence of pest and diseases thereby affecting the quality and quantity of yield.

The vegetable seed system is not different from the main seed system in the country. It is however, weak in terms of seed supply for crops such as tomatoes, garden eggs, okra and others. However, pepper seeds can be found relatively easier in some agricultural input shops. The informal seed system is the main routine for vegetable seed distribution in the country. Vegetable Seed marketing and quality assurance is relatively weak and developing.

The source of seed for vegetable production like any other crop is very critical to ensure good quality seedlings and optimal growth in the field after transplanting. Seed viability has direct effect on yield performance and thus ensuring use of quality seed is very essential. The result indicates that 45.3% of respondents acquired their vegetable seeds from private seed growers who were in the communities or elsewhere (Figure 1). This is in consonant with Etwire et al. 2013 who found that 88.2% of Ghanaian farmers generally obtained seeds through agro input dealers. What was difficult to determine was the quality of seed been offered to these farmers. Farmer saved seed was also another important source (37.2%) as well as sourcing of seed from other farmers (32.1%). This confirms the fact that majority (over 80%) of smallholder farmers in Africa mainly obtain their seeds from informal channels which include farmers' own saved seeds, seed exchanges among farmers and finally purchases from the local seed markets (Rajendran et. al., 2016; Louwaars and De Boef, 2012; Maredia et al., 1999; Crissman et al., 1993).

Development of a seed system requires diverse complementary supply channels of distribution so as to strengthen supply points and distribution outlets. The role of private seed companies was found to be minimal as depicted by 10.2% of respondents sourcing seed from them. This was due to the spatial, time, value and information gaps that exist between them and producers.

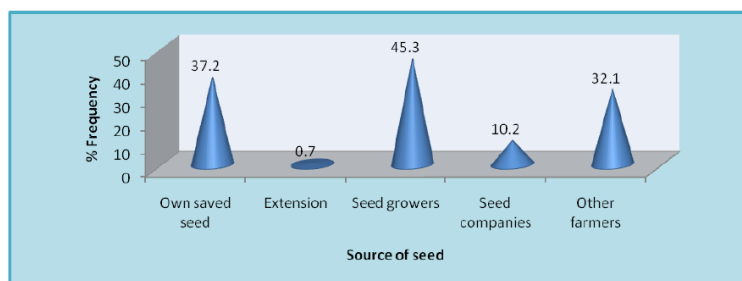


Figure 1. Source of seed

Source: Field Survey, 2015

Seed quality is an important determinant of seed germination. As indicated, most farmers sourced their seeds from sources for which it was difficult to ascertain the quality. About 49% (Figure 2) of respondents claimed they were able to determine seed quality. They could however, only assess seed quality in the field through what is often referred to as "neighbour certification" (Lyon and Afikorah-Danquah, 1998). Neighbour certification is the physical observation of the vegetative performance of a crop as a proxy for seed quality. This method is not scientifically robust and is done after planting reducing the probability of detecting poor quality seeds before planting. Building capacity of farmers in seed testing will be an important means to strengthen the current seed supply and distribution system.

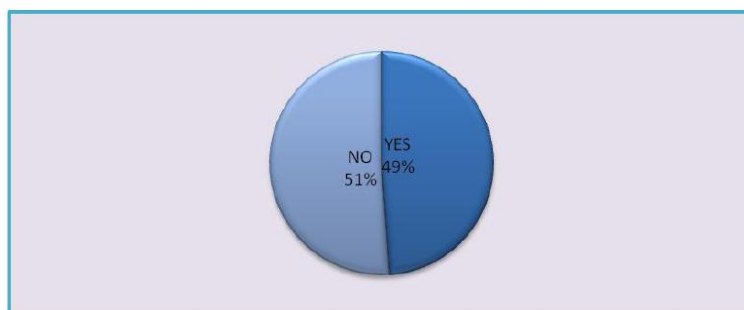


Figure 2. Ability to determine seed quality

Source: Field Survey, 2015

One of the biggest problems confronting vegetable farmers in Ghana is the high incidence of diseases and pests which ravage their crops (Asare & Micah, 2014). To prevent rodent attacks and other insects, seed treatment is very critical in ensuring the quality of seeds stored is not compromised during storage and before planting. However, respondents in the study area gave little attention to seed treatment. Only 10.9% treated their seeds before storage and 38.7% (Figure 3) before planting. This result is similar to findings by Tripp et al; (1998) who indicated the mean germination rate for cowpea farmers in Wenchi was 65.7% and 70.3% for Akatsi lower than the Ministry of Food and Agriculture's acceptable standard of 75%. The success of a vibrant seed system in the area will therefore require capacity building in seed treatment.

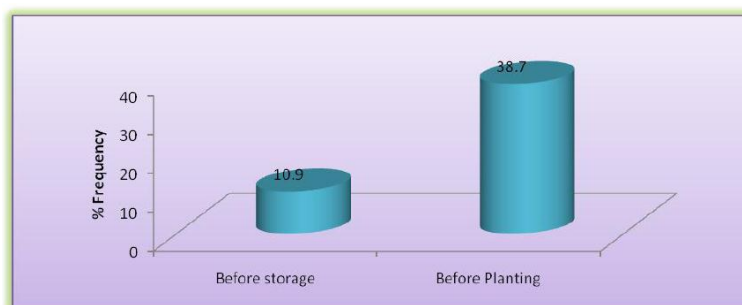


Figure 3. Seed treatment

Source: Field Survey, 2015

With only 10.9% of respondents treating seed before storage, 23% (Figure 4) of seed stored was lost in storage with some farmers losing 100%. This affects the amount of seed available for planting and reduces the farmers ability to cultivate larger acreage. The end result is reduced output leading to reduced income and its effects on food and nutritional security.

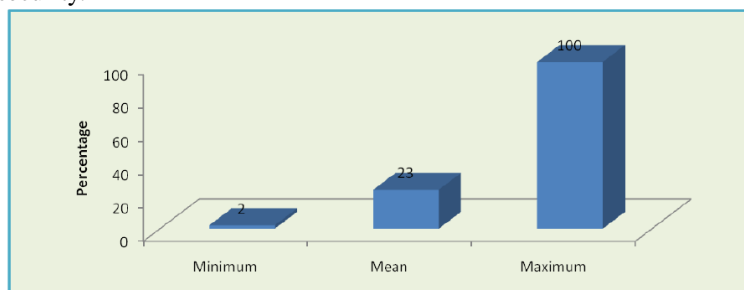


Figure 4. Percentage waste in storage

Source: Field Survey, 2015

To avoid rodent and other insect attack, the use of botanical extracts like neem is highly recommended. This is due to its availability and cost effectiveness. Its use in the study area was however, very limited such that only 2% (Figure 5) of respondents indicated the use botanical extract for seed treatment. Capacity building on the preparation and use of these extracts will therefore be very important in strengthen the seed system in the area.



Figure 5. Use of Botanical extract for seed treatment

Source: Field Survey, 2015

Farmers within the study area receive technical information about seed from different sources . The role of farmer to farmer dissemination was confirmed in terms of serving as a major source of information on seed. About 68% (Figure 6) of respondents had information on seed from other farmers. This was followed with 16% from Agricultural extension and 6% from electronic media. Improved seed production technology dissemination should therefore focus on farmer to farmer approaches with an intergration of electronic media. Electronic media has the advantage of wide coverage and exploring its use will help reach a larger audience.

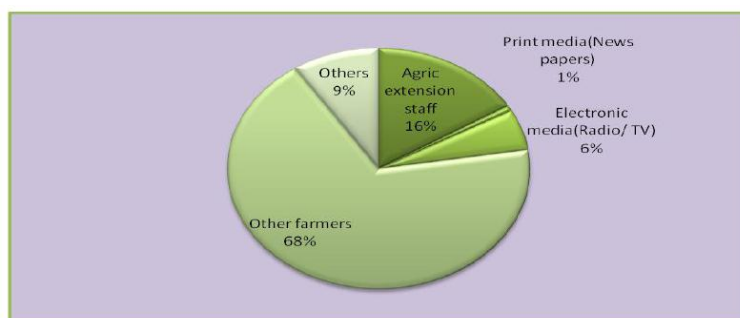


Figure 6. Source of message on seed

Source: Feild Survey, 2015

The role of farmer to farmer technology dissemination is still relevant in current production systems. Findings of this study show that 53.3% of respondents have a strong association with other farmers. About 40.1% and 38.7% (Table 1) also indicated their interection with extension services and land owners respectively. Strengthening the

seed system will therefore required close collaboration with lead farmers in the communities, extension services and land owners for effective technology dissemination and adoption.

Table 1. Association with supply chain actors

Actors of the seed chain	% Frequency
Seed grower/companies	26.3
Other farmers	53.3
Extension services	40.1
Financial institutions	21.2
Land owners	38.7
Water supplies	0.7
Spraying gangs	5.1

Source: Field Survey, 2015

The importance of any association is the benefits that accrue from that association. From the study, four major benefits accrue from association of respondents with supply chain actors namely; sale of seed, training, land for production and access to credit. Benefits in terms of association from other farmers was mainly on the sale of seed (32.8%). Extension supported respondents with training (29.2%) and financial institutions with credit (16.1%).

Table 2. Type of association with seed supply chain actors

	Sale of seed	Training	Credit	Land for production	Spraying services	Control of Chemicals
Seed grower/companies	24.8	5.1				
Other Farmers	32.8	6.6	5.8	2.2	2.2	
Extension services	1.5	29.2	0.7	0.7		2.9
Financial institutions		2.9	16.1			
Land owners				26.3		

Source: Field Survey, 2015

Seed certification is another important parameter in ensuring seed quality. With some respondents claiming they are able to determine seed quality, it was important to find out whether they have access to certified seed. From the study, 39% (Figure 7) had access to certified seed. This creates a high deficit for which the market potential exists for certified seed production and supply.

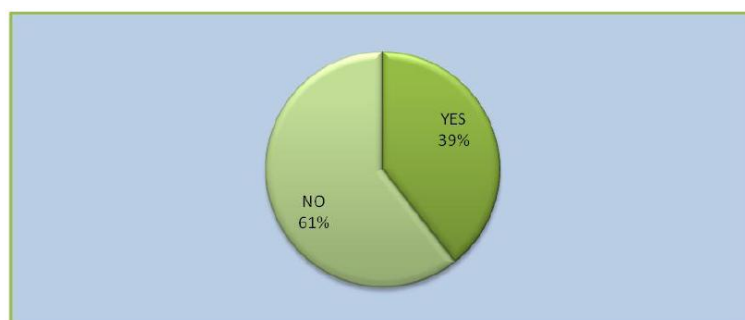


Figure 7. Use of Certified Seed

Source: Field Survey, 2015

4. Conclusion and Recommendations

The vegetable seed supply and distribution system in the study area is at the rudimentary stages of development and requires a lot of support to become vibrant to meet growing demands of smallholders. Farmers still relied on farmer saved seed (37.2%) and seed from other farmers (32.1). Access to technical information was heavily dependent on colleague farmers (68%). Seed distribution channels were poorly linked with limited access to financial credit. Seed viability cannot be assured since very few farmers had access to certified seed (39%) and had no scientific way of determining viability. Poor supply chain actor linkages was a constraint to developing a vibrant seed system. The low level of seed treatment before storage (10.9%) and before planting (38.7%) led to huge losses (23%) affecting quality and quantity for planting. The rate of germination is also affected resulting in low yields. It is therefore important to find pertinent solutions to constraints affecting the vegetable seed system to increase vegetable crop productivity. The following are therefore recommended;

- Building capacity of farmers in seed germination test and treatment.
- Development of strong supply chain actor linkages using innovation platform approaches that encourage private sector involvement
- Create enabling policy environment for the establishment of a vibrant formal seed system to enhance widespread access to quality seed.

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References

- Asare, B. E., & John, A. M. (2014). *Vegetable Crop Protection Practices and Policy Related Issues in the Rural and Peri-Urban Areas of the Cocoa Belts of the Ashanti and Western Regions of Ghana*. Draft Consultant Report Submitted to the World Vegetable Centre
- Crissman, C. C., Crissman, L. M., & Carli, C. (1993). *Seed Potato Systems in Africa: A Case Study*. Lima, International Potato Center.
- Etwire, P. M., Ibrahim, D. K., Atokple, S. S. J. B., Alhassan, L. A., Afia, S. K., & Peter, A. (2013). Analysis of the seed system in Ghana. *International Journal of Advance Agricultural Research*, 7-13
- Kuhlmann, K., & Yuan, Zh. (2016). Seed Policy Harmonization in ECOWAS: The Case of Ghana. Syngenta Foundation for Sustainable Agriculture working paper
- Louwaars, N. P., & De Boef, W. S. (2012). Integrated seed sector development in Africa: A conceptual framework for creating coherence between practices, *Programs, and policies*. *J. Crop Imp.* 26, 39-59. <http://dx.doi.org/10.1080/15427528.2011.611277>
- Lyon, F., & Seth, A. D. (1998). Small-scale seed provision in Ghana: social relations, contracts and institutions formicro-enterprise development. *Agricultural Research & Extension Network paper*, 84.
- Maredia, M., Howard, J., Boughton, D., Naseen, A., Wanzala, M., & Kajisa, K. (1999). Increasing Seed System Efficiency in Africa: Concepts, Strategies and Issues. Michigan State University. *Department of Agricultural Economics- International Development Working Paper*, 77.
- Rajendran, S., Afari-Sefa, V., Karanja, D. K, Musebe, R., Romney, D., Makaranga, M., Samali S, & Kessy, R. (2016). Farmer-led Seed Enterprise Initiatives to Access Certified Seed for Traditional African Vegetables and its Effect on Incomes in Tanzania. *International Food and Agribusiness Management Review*, 19(1), 1-24.
- Tripp, R., Walker, D. J., Opoku-Apau, A., Dankyi, A. A., & Delimini, L. L. (1998). *Seed management bysmall-scale farmers in Ghana*. A study of maize and cowpea seed in the Brong-Ahafo and Voltaregions. NRI Bulletin 68, Working Paper
- Weinberger, K., & Lumpkin, T. A. (2007). Diversification into horticulture and poverty reduction: A research agenda. *World Development*, 35(1), 1464-1480. <http://dx.doi.org/10.1016/j.worlddev.2007.05.002>

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