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The Present Status of Shallot (*Allium ascalonicum* L.*)* Farming Enterprise in Ghana: The Case of Keta Municipality

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ABSTRACT

The study was carried out to determine the present status of the shallot (*Allium ascalonicum* L.) farming enterprise in Ghana. The Keta Municipality was selected as the study area because it is a major shallot growing area within the dry coastal equatorial climate with an average annual rainfall of less than 1000 mm. A multistage sampling technique was used to select the respondents for the study while interview schedules were used for data collection on characteristics of shallot farmers. The data were analysed with SPSS version 21 using descriptive statistics such as frequencies and percentages. The study shows that a large majority (67%) of shallot farmers were males whilst 33% were females. Mono-cropping is the type of farming system used by the farmers with organic and inorganic fertilizers as the main source of plant nutrients. To attract more farmers into shallot farming in Ghana, it is important that, Non-Governmental Organizations (NGOs) and other stakeholders including government and the Ministry of Food and Agriculture should help create the enabling environment that will ensure that the menace of pests and diseases are minimized and prices of shallot are regulated. The production of shallot is considered to be lucrative but fluctuating local market prices, pests, diseases, and lack of capital are the major limitations of the enterprise.

Keywords: Bulbous vegetable, cash crop, Keta, mono-cropping, NGO, viable enterprise.

INTRODUCTION

Shallot (*Allium ascalonicum* L) is a member of the genus Allium and is of significant commercial importance to vegetable growers' worldwide (Blay et al., 2002). The Technical Centre for Agricultural Cooperation (CTA, 1993) ranks the *Allium spp*. as the second most popular group of vegetables in the developing world. Shallots are staple vegetable. Fresh fruits and vegetables are very important sources of vitamins and minerals that are essential for healthy human diet. Shallots have become an important cash crop in many parts of the world (Babalola, et al., 2010). The use of shallots is about 18 percent of the average daily consumption of vegetables in Nigeria (Olayide et al., 1972). Shallots may be eaten fresh as salad or used for cooking in soups or stews. Shallot was introduced into the Republic of Togo around 1800 and from there to Anloga in Ghana, where its production has become an industry covering an area of about 3000 hectares. They are almost exclusively mono-cropped using organic fertilizers as the main source of plant nutrients (Norman, 1992). To ensure reasonable yields, the farmers in the area have devised an ingenious method of utilizing fish waste from a booming anchovy industry in the area to maintain soil fertility. There are three growing seasons in the study area. January to March is the minor season while April to August is the major season. September to December is the intermediary season for the farmers.

Due to the dwindling fishing industry in the Keta Municipality, greater attention has been shifted to vegetable production (Kortatsi et al., 2005). Almost all available lands within the Keta Strip not occupied by houses are utilized for shallot production. Interestingly, there is very little empirical information specific to Ghana that supports these claims by politicians and the media to inform decision-making by potential shallot farmers, horticulturists and agricultural policy makers on the issue. Because of the importance of shallots in the economy of the country, most of the studies on shallot in the study area focuses on production without much work on status of shallot farming in the Keta Municipality. It is this gap in knowledge that this study intend to fill.

Objectives of Study:

The general objective of the study was to describe the present status of shallot farming in Ghana based on a case study of the Keta Municipality which is a major shallot growing area in Ghana. The specific objectives were to describe the demographic characteristics of shallot farmers and to identify the challenges and prospects of the shallot farming business in the study area. The intent is to provide empirical information on the status of shallot farming business in Ghana, which hopefully, will inform production and policy decisions by government and stakeholders including farmers in their effort to promote sustainable shallot production in Ghana.

Literature Review:

Soils for growing shallots are typically sandy, with low organic matter content and poor cation exchange capacity. Sandy loam or loam soils are preferred, but shallots have been successfully produced on a wide range of soils (Grubinger, 1999). The best soils for growing shallots are deep, well-drained clay loams of pH 6.5 to 7.5 that have high levels of organic matter (Rutgers, 2016). Shallots have been successfully grown on a wide range of soils, from relatively shallow, low pH sandy soils, to well-structured red volcanic soils and alkaline alluvial soils. Shallots are adapted to growing in cool, mild to mild tropical climates. Seeds germinate at a temperature range of about 10°C to 30°C, with an optimal germination temperature of between 18°C and 24°C. The ideal growing temperature is in the range of 13°C to 24°C. Plantings should be timed to avoid periods when daytime temperatures exceed 27°C. Shallots require specific day lengths for bulb initiation, and will bolt if there are a sufficient number of days below the minimum required for flowering (Queensland Government, 2015).

Species vary in form and colour and are cultivated in many areas, but the main production area is on the lower bank of the 'Volta' river. Shallot is planted as topped and whole bulb in different parts of the world. The growing portion of the bulb is topped one-fourth to one-third of the height for easy and quick sprouting of more growing buds (Rashid and Singh, 2000; Robinowitch and Kamenetesky, 2002). Peter (2006) also reported that bulbs are topped to break bud dormancy and enhance uniform sprouting prior to planting. Sharma et al. (2008) however reported that planting whole onion bulbs produced significantly higher bulb yield (1.57 $Mt{\cdot}ha^{-1}$), more than one-third topped bulbs. Getachew and Asfaw (2000) also reported that topped medium sized bulbs had a lower crop stand and less fresh bulb yield than whole bulbs of the same large-sized bulbs and attributed this to reduce initial food reserve and pre disposal of bulbs to diseases and other decaying organisms. Bodnar (2010) reported that shallots planted at 15 to 20 cm between bulbs had the highest marketable yield. There is variation of recommendations for plant spacing for shallot, and growers in developing nations do not generally use uniform plant spacing to grow shallots. Some farmers use an intra-row spacing recommended for onion (10 cm) despite the fact that shallots produce multiple bulbs per plant unlike onion and need totally different intra-row spacing (Ademe et al., 2012).

Unlike the common onions, shallots are distinguished by the production of lateral shoots. Any factor that affects the number and size of bulblets developing from the lateral branches will have a great impact on yield and quality of the crop (Woldetsadik et al., 2003). A previous study in eastern Ethiopia showed a negative response of rain-fed shallots (350 mm during the growing season) to nitrogen fertilization; however, with four supplemental irrigations of 50 mm each, yield was increased by application of N up to 150 kg ha±1 (Woldetsadik et al., 2002). The continually growing demand on a limited water supply along with the ever-increasing cost of nitrogenous fertilizers necessitates judicious use of both water and nitrogen without adversely affecting shallot yield and quality.

According to Mishra et al. (2014) there are a number of pathogens and insect pests that attack shallot plants throughout their developmental stages and significantly reduce the crop yield. Disease severity is influenced by the weather and storage conditions, crop rotations, harvesting periods and disease control methods. The physiological maturity of onions at harvest can also affect the incidence and severity of rot in stored onion bulbs. If the control of onion diseases in the field is not efficient, the storage losses will also increase (Droby and Lichter, 2007). Neck rot is primarily a storage disease, but the origin of infection is associated with the field. The fungus usually infects onions through the neck tissues or wounds in the bulbs (Mishra et al., 2014).The major pathogens responsible for post-harvest diseases are *Botrytis*, *Penicillium*, *Mucor*, *Fusarium* and *Aspergillus*, while *Botrytis cinerea* is among the prevailing fungi. Absence of improved shallot varieties also is an impediment to production and productivity.

In order to control the pest and plant diseases, farmers generally use pesticides as the main option considered most practical. The use of pesticides in order to control the shallot pest attack tend not appropriate, whether it is the appropriate type, the appropriate way, appropriate dose, right on target and on time or called the five appropriate. The results of Riyanti (2011) study showed that the use of pesticides to shallot crops in Brebes district in Indonesia do not follow the five proper rules, where farmers spray based on a period of every 3 to 4 days. The dose used in these studies is as follows, the dose of insecticide 6.27 liters per hectare, fungicide at 9.28 kg per hectare and the adhesive 3.28 liters per hectare. Dinakaran et al. (2013) also reported that farmer in India had a pesticide spray every 2 until 3 days in nursing their shallot crops without calculating the attack level of pest and plant diseases. Just as common farmers in general, the respondent of shallot in this research are also depend on pesticide in controlling the pest and plant diseases.

The use of pesticide as production input had been known very effective in controlling the pest and plant diseases on shallot crop, so it does not disrupt the crop growth and could give optimum result (Riyanti, 2011). However the use of pesticide had negative risk which is significant to human and other organism to the environment. On human, exposure to pesticides may increase the risk of adverse health in the long term, such as sensory disturbance, eye irritation, dermatologic reactions, liver damage, respiratory problems, increased cancer risk, the risk to the fetus, endocrine disorders, immunological effects, and many others (Calvert et al., 2008). Other organisms also bear unintended consequences of the use of pesticides, the presence of natural enemies, organisms in soil and other useful animals. Due to serious impact that has relation with the use of agriculture pesticide towards human health and environment, thus resulting movement toward decreased use of pesticides and integrate it with a non-toxic approach to pest control (Gretz et al., 2011). Nontoxic approach generally called as Integrated Pest Management (IPM), implementation in the long term is expected to provide improvements in environmental conditions or environmental conditions have the nature of sustainability.

In developing countries like Ghana, storage, packaging, transport and handling techniques are practically non-existent with perishable crops and so, this allows for considerable losses of produce. Thus as more fresh fruits are needed to supply the growing population in developing countries, as more produce is transported to non-producing areas and as more commodities are stored longer to obtain a year round supply, post-harvest loss prevention technology measures become paramount (Oyekanmi, 2007). Post-harvest losses have been highlighted as one of the determinants of the food problem in most developing countries like Nigeria (Babalola et al., 2008). Post-harvest diseases cause major losses during onion storage (Wright et al, 2001). Evidence suggests that these losses tend to be highest in countries where the need for food is greatest (Oyewole and Oloko, 2006; Babalola et al., 2008). Unfortunately, in many countries experiencing serious food problems, there seems to be no consistent food policy framework which should form the foundation of effective implementation of programmes (Ojo, 1991).

Long shelf-life of shallot bulbs, with little loss of weight, and other quality parameters, are important for obtaining high prices. Storage of shallot bulbs after harvesting poses a problem for growers in tropical regions due to postharvest loss owing to reduced bulb weight, bulb rotting, bulb sprouting and bulb rooting (Sebsebe and Workneh, 2010). A complex interaction of pre- and post-harvest factors, which include mineral nutrition, cultivar, bulb maturity and conditions during maturation and harvesting and curing affect bulb shelf life (Kale, 2010). Sebsebe and Workneh (2010) reported increased bulb rotting and sprouting, loss in bulb diameter, bulb weight loss and un-marketability due to increased N application. Tekalign et al. (2012) indicated that increased rates of N and P fertilizers increase cumulative weight loss, bulb sprouting, and rotting in onion. Kale (2010) reported reduced onion shelf-life and quality due to high N fertilizer. High storage loss could compel shallot producers to sell their product immediately after harvest when the price is low (Tiru et al., 2015). Absence of cultivars with good keeping quality and lack of storage facilities aggravate the problem. Although research results are available on effects of nitrogen fertilizer on productivity and shelf-life of allium species, response to nitrogen fertilizer generally varies from place to place as it is based on soil fertility status, environmental condition and the cropping system (Tiru et al., 2015).

Vegetable supply can be improved either by increase in production or reduction in loss. Since many researches show that great effort is being made in the area of vegetable production especially in the developing countries, the decline in vegetable production therefore can be traced to food losses (Bautista, 1990). Thus, reduction in post-harvest losses increases vegetable availability, hence alleviation of vegetable problems. The effect of post-harvest losses reduces the effect of the efforts put into production and lowers marketing efficiency (Okunmadewa, 1999).

MATERIALS AND METHODS

Study Area:

The Keta Municipality which lies within Longitudes 0.30° E and 1.05° E and Latitudes 5.45° N and 6.005° N was selected as the study area because it is a major shallot growing area within the dry coastal equatorial climate. The average annual rainfall of Keta is less than 1000 mm. Keta is located east of the Volta estuary, about 160km to the east of Accra, off the Accra-Aflao main road. It shares common borders with 'Akatsi South District' to the north, 'Ketu South District' to the east, 'South Tongu District' to the west and the 'Gulf of Guinea' to the south (Fig. 1). Out of the total surface area of 1,086km^2, approximately 362km^2 (about 30 per cent) is covered by water bodies. Keta Municipal lies within a double or bimodal rainfall regime. Mean monthly rainfall increases from March until it peaks in June. March has a mean of about 61.4mm and June 223.9mm. There is a sharp break in rainfall in July and August for about six weeks. July and August therefore constitute a short dry season in the study area, which separates the major rainy season (March-June) from the minor rainy season (September-October). The study area has two wet seasons and two dry seasons. The first wet season lasts from March to June. About 75 % of the total rainfall occurs in these four months of the year.

Fig. 1. Map of shallot growing areas in Keta Municipality, Ghana (Source: Thematic mapping Division, CSIR-INSTI).

Sampling Procedure and Sampling Size:

A multi-stage sampling technique was used to select the respondents for the study. Firstly, all shallot producing areas were identified and secondly a list of registered shallot farmers was collected from the Municipal agricultural office of the Ministry of Food and Agriculture (MOFA). Thirdly, from the list collected, a random sampling method was used to select one-third ($^1/_3$) of the shallot farmer population in each community and interviewed for the study. In all, three hundred and eighteen (318) farmers from Anloga, Atorkor, Wuti, Dzita, Anyanui, Woe, Tegbi and Vui were purposively selected out of nine hundred and sixty one (961) farmers. Table 1 provides the summary of farmers selected from the communities for the study.

Table 1. Location and numbers of sampled shallot farmers.

Community	Number of Farmers	Number Sampled
Anloga	217	72
Atorkor	186	62
Wuti	155	51
Dzita	124	41
Anyanui	93	31
Woe	93	31
Tegbi	62	20
Vui	31	10
Total	**961**	**318**

Data Collection:

Interview schedules were used for data collection on characteristics of shallot farmers, farming systems used, prospects of shallot farming and major limitations in shallot farming. The data were analysed with SPSS version 21 using descriptive statistics such as frequencies and percentages.

RESULTS AND DISCUSSION

Demographic Characteristics of Shallot Farmers:

The result in Table 2 indicates that majority of the farmers (67.0%) were males while 33.0 % were females. This may be attributed to either the stress involved with shallot farming activities, gender division of labour or access of females to lands due to their cultural background as well as prevailing norms and values of the people of the study area. This agrees with the findings of Ogunbo (2011) who reported that 85 % of vegetable farmers in Ogun State, Nigeria were male. Oladele (2011) also reported 76% males among indigenous fruit and vegetable farmers in Oyo State, Nigeria. Generally, men are reported to be more engaged in agricultural activities while women served as helping hands in harvesting, transportation, marketing and processing of agricultural products including vegetables (Oladele, 2011; Oyesola and Obabire, 2011). The age range of shallot farmers in the communities is presented in Table 2. The Table showed that most of the respondents were within age range of 20 – 39 years corresponding to 48.4 %. Equally, 38.7 % were also within the age range of 40-59 years and 12.5 % above 60 years. This implies that majority were adults who were more experienced in shallot farming thereby increasing shallot productivity. Mohammed et al. (2013) reported that 94.83% of vegetable farmers in Ethiope LGA of Delta State were between the ages of 20-60 years which agrees with the results of this study. The findings in Table 2 showed that most of the shallot farmers (39.4 %) had primary education, 33.6 % had non-formal education, and 24.5 % and 2.5 % of the shallot farmers had secondary education and university education respectively. The finding implied that almost all the farmers had attained one type of education or the other. This finding is in accordance with Okwu et al. (2007) who reported that an individual's level of education was found to affect his or her access, comprehension and adoption of modern agricultural practices. Additionally, most (74.2 %) of these farmers are full-time shallot growers and have been in the business for over six years. Farming experience of farmers to a large extent affects their managerial know-how as well as the use of various extension methods (Aina, 2006).

Table 2. Demographic characteristics of shallot farmers.

Characteristic	Frequency	Percent
Sex		
Male	213	67.0
Female	105	33.0
Age (years)		
20-39	154	48.4
40-59	123	38.7
>60	41	12.9
Education level		
Non-formal	107	33.6
Primary	125	39.4
Secondary	78	24.5
University	8	2.5
Level of occupation		
Full-time	236	74.2
Part-time	82	25.8
Years of experience		
1-5	100	31.4
6-10	116	36.5
>10	102	32.1

Method of Farming:

The method of farming practised in the study area is mono-cropping using organic and inorganic fertilizers as the main source of plant nutrients. A farmer may have many beds, but the total area seldom exceeds one acre. Bulbs are planted about 8 centimetres apart and about 1.36 kg of small-sized bulbs are required to plant an acre. This would yield between 4.08 to 4.5 kg of bulbs depending on the nutrient level of the soil and the cultural operations performed after planting. The yield in the dry season is higher than in the wet season. No machines are used and no attempt is being made at mechanization due to the nature of land holdings. Irrigation is mostly done by hand with water drawn from shallow wells and most farmers have a sufficient number of wells to supply the required amount of water. The cost of planting material (bulbs) is very high ($13- $15) and most farmers save their own material for planting. Farmers like to have fresh seed material (about once in 4 or 5 seasons) and therefore purchase it at high cost from growing areas in the Republic of Togo. Fertilizers are applied in 3 split applications at weekly intervals beginning from time of planting using medium-sized bulbs. Farmers use cow manure, bat manure and small dried fish to maintain soil fertility. Since manures are brought from distant places, they are expensive. The price of a 65kg bag of manure costs between $39 and $63. Fertilizer mixtures are used on a fairly large scale, thus reducing cost.

Prospects of Shallot Farming:

A greater proportion of the shallot farmers (68.6 %) who participated in the study indicated that there was ready market for shallot and 76.4 % of the farmers were satisfied with the price offered to them by buyers (Table 3). Farmers sold their produce directly to wholesalers (50.9 %), retailers (36.8 %) and 34.0 % directly to consumers. The farmers claimed prices offered by wholesalers were relatively low compared to the others. Furthermore, a substantial proportion of the farmers (95.0 %) indicated that the shallot business is profitable and consequently had a very bright future.

Table 3. Prospect of shallot farming in the study area.

Factors	Frequency	Percentage
Market Availability		
Ready market	198	62.3
No ready market	113	35.5
Yet to sell produce	7	2.2
Satisfaction with Price Offered		
Satisfied	185	58.2
Not satisfied	106	33.3
Yet to sell produce	27	8.5
Market Channel		
Retailers	94	29.6
Wholesalers	139	43.7
Direct sale to consumers	85	26.7
Level of Profitability		
Very profitable	148	46.5
Profitable	103	32.4
Moderately profitable	67	21.1
Supposed future of the industry		
Very bright	196	61.6
Bright	122	38.4

Major Limitations of Shallot Farming:

The research revealed that shallot farmers in the study area were confronted with a number of problems. The most popular among these were fluctuating local market price of shallot (19.5 %), incidence of pests and diseases (17.6 %); lack of capital (16.9 %) and high cost of inputs (12.6 %). The rest were lack of storage facilities, theft, labour cost for farm maintenance, unfavourable weather conditions and importation of foreign shallots into the country (Table 4). Farmers mostly sell their shallots after drying them, but, just like most agricultural crops in Ghana (FAO, 2004; Karlan et al., 2010), the price fluctuates between very low to high especially during main and off seasons of shallot. Price fluctuation which is usually beyond the control of farmers makes their income uncertain and can make a significant difference in how much a family earns for the year. According to Karlan et al. (2010), this situation can make farmers unwilling to take on additional risks by borrowing and making long-term investments due to this uncertainty. Capital however is an essential input for the production of any agricultural commodity including shallot. Lack of funds makes farmers unable to buy the necessary inputs which they claim to be expensive, and expand and maintain their farms. The farmers in the study explained that they use their own personal saving or borrow from friends, family and money lenders for their shallot business. The advantage of informal credit is that the provision of the loans is relatively faster although often more expensive compared to the banks (MacPherson and Agyenim-Boateng, 1991). High lending rates have scared many potential shallot farmers from taking loans from the financial institutions.

Shallot diseases and pests are other serious threats that confront farmers in the shallot industry in the study area. According to Mishra et al. (2014), several diseases and insect pests affect the crop during the entire cropping period. There are a number of pathogens and insect pests that attack shallot and garlic plants throughout their developmental stages and significantly reduce the crop yield. Shallot thrips (*Thrips tabaci*) are the major insect pest of shallots. They cause white flecking on the leaf surface and a dramatic reduction in foliage quality. The farmers isolated the shallot fly (*Delia antiqua*) as their major economically important pest in the area. The larvae or maggot enters the shallot fruit and feed on the pulp from inside. Shallot diseases indicated by the farmers are Downy mildew (*Peronospora destructor*) and purple blotches (*Alternaria porri*), the major leaf diseases affecting shallots. As they damage leaves, their control is critical for producing a quality product. Very few chemicals are registered for controlling these diseases. White rot (*Sclerotium cepivorum*), pink root (*Pyrenochaetater restis*) and fusarium (*Fusarium sp.*) are the major soil-borne diseases affecting shallots. No products are currently registered for controlling these diseases in shallots. These pests and diseases can affect all parts of the shallot plant and reduce yield (Gupta and Satish, 2008). The major fungal disease in the study area is Black mold (*Aspergillus niger).* This is a major fungal disease of shallots and a great threat to the shallot industry, which when not controlled can lead to post-harvest losses and ruin an otherwise high quality shallot fruits.

Table 4. Constraints of shallot farmers in the study area.

Constraints	Frequency	Percentage
Fluctuating local market price of Shallots	62	19.5
Pests and diseases	56	17.6
Lack of capital	54	16.9
High cost of inputs	40	12.6
Lack of storage facilities	30	9.4
Theft	22	7.0
Labour cost for farm maintenance	20	6.3
Unfavourable weather condition	18	5.7
Importation	16	5.0

Policy Implication:

To attract more farmers into shallot farming in Ghana, it is important that, Non-Governmental Organizations (NGOs) and other stakeholders including government and the Ministry of Food and Agriculture should help create the enabling environment. This will ensure that the menace of pests and diseases are minimized and prices of shallot are regulated as in cocoa marketing in Ghana. Also, policies and systems should be developed by the Ministry of Food and Agriculture to make capital available to the farmers. Farmlands can be acquired by the government by appealing to traditional leaders in the various communities. For sustained markets, the government should direct the school feeding programme to buy shallots for preparing food for the school pupils. This will enable potential farmers including the numerous educated youth and women to enter into the shallot farming business. Furthermore, the provision of good storage facilities to store the produce that are harvested before they are taken to the market will help reduce losses and increase revenues accruing to the farmers. Training initiatives on post-harvest handling of shallots should be encouraged and follow-ups, feedback and adoption assessment should be conducted periodically for sustainability. Establishment of farmers market and cooperative marketing should be encouraged by the Ministry of Food and Agriculture to reduce losses related to marketing functions.

CONCLUSION

The production of shallots is considered to be lucrative. Efficiency will likely have to be improved to meet future demand while good storage facilities will become necessary. Alternative methods of sale have to be developed from a changing production environment. Equally, fluctuating local market price, incidence of pests and diseases; lack of capital and high cost of inputs are the most common challenges confronting the shallot farmers. The less common ones are lack of storage facilities, theft and labour cost. Invariably, despite the numerous constraints in the shallot farming business, the industry has a bright future. Thus, increasing government and other stakeholder interest in the shallot farming industry will be a priority that will serve the best interest of the people of the Keta Municipality and the country as a whole.

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