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**Livestock inventory of small-scale farms in Ghana
with the special focus on feedstuffs**

Master's thesis

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Declaration

I declare that I have worked on my diploma thesis titled "Livestock inventory of small-scale farms in Ghana with the special focus on feedstuffs," by myself and I have used only the sources mentioned at the end of the thesis. As the author of the diploma thesis, I declare that the thesis does not break copyrights of any person.

In Prague 27th April, 2018.

B.Sc. Eugene Okraku Asare

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Abstract

In Ghana, livestock production has become one of the most important source of protein in human diets. Livestock animals feed on different varieties of plants, farm residues or industrial waste for their nourishment. The aim of the study was to determine livestock and mini-livestock species diversity and numbers, to evaluate management of small-scale farms in relation to nutrition and feeding of animals. Also to determine the source of feeds and define feedstuff costs. Ten communities were selected from the Ga East district for the research using the snowball sampling technique. Semi-structured questionnaires were administered to 30 respondents. Animal species identified were poultry, pig, cattle, sheep, goat, grasscutter, rabbit, fish and snail with their breeds. The source of the breeds were local and imported. A total of 21 local plant species were identified. Poultry and pig prevails more in the district. Income generation was the main reason for keeping livestock. Only poultry, pig and fish bought feedstuff to feed their livestock. The two seasons (dry and wet) was a key determinant of feed availability; feed was abundant during the wet season and scarce during the dry season. Main identified constraints faced by small-scale farming were health problems, feed availability during the dry season and bush fires. It is therefore recommended that farmers should adopt forage cultivation into their annual farming systems to supplement the feeding of their livestock.

Keyword: small-scale farming, breeds, species, local plant, nutrition

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List of the abbreviations used in the thesis

FAO: Food and Agriculture Organization

GDP: Gross Domestic Product

GFMA: Ghana Feed Millers Association

GSS: Ghana Statistical Service

LU: Livestock unit

MLGRD: Ministry of Local Government and Rural Development

MoFA: Ministry of Food and Agriculture

SRDA: Survey Research Data Archive

1. Introduction

Ghana, located in Africa, covers 227,533 sq. kilometres of land and 11,000 sq. kilometres of water, making it the 82nd largest country in the world, covering a total area of 238,533 sq. kilometres (GSS 2012). The country shares boundary with the Republic of Togo on the east, Burkina Faso on the north and Côte d'Ivoire on the west. The Gulf of Guinea of the Atlantic Ocean lies south of the country, forming a coastline 550 km long.

The Greater Accra Region; Accra is the capital and most populous city of Ghana, with an estimated urban population of 22,700,000 as of 2012 (GSS 2012). Accra is also the centre of the metropolitan area, with a population of about 4,000,000 people. The metropolitan area is the 13th largest in Africa. The region covers a total land surface of 3,245 sq. kilometres or 1.4% of the total land area of Ghana.

Accra is influenced by the local steppe (grassland plains without trees apart from near rivers and lakes) climate. There is not much yearly rainfall in Accra. In a year, the average rainfall is 809 mm. The driest month is January, with 14 mm of rainfall. The highest amount of rainfall is recorded in June, averaging 208 mm. February is the hottest month, with temperature at 28.1 °c. August is the coldest month (MLGRD 2006).

According to FAO (2011), small scale farming is a type of management system where the farm unit (a single farmer or a couple or a family or a cooperative) is at the same time the owner, the worker and the one who makes the decisions. This means that the farmer arrives at the decision making process and he/she plays a key role in several options encompassing breeding, for example the crop and type of seeds to sow, the number of animals and their breed, the periodic pasturelands and pastoral movability, the selling of livestock and the selling of the final products. Small scale farming gives farmers an active role and admits their roles, networking consumers' need and situation. There is more to finances, as it goes beyond the financial balance of the farm (as difference between income and outcome) involving a great need for a viable use of the environment, as a key skill needed for

continuity. A report from Winrock International (1992) stated that livestock production contributes 35% to the agricultural Gross Domestic Product (GDP) of sub-Saharan Africa. The livestock numbers in this area is estimated to be 176,800,000 sheep, 210,500,000 goats and 216,600,000 cattle (FAO 2006).

The gains of livestock in Ghana cannot be over highlighted. It adds hugely to food preservation through its straightforward manufacture of food and non-food purposes (Sanon 1999). It is also a main activity in the subsistence of many and contributes immensely to proceeds. Livestock production is a crucial aspect of Ghana's agriculture and creates a key to the nation's development. Livestock is an important source of meat and a livelihood for millions of individuals in Ghana. For many, animals are a source of income, food, clothing and labour. Livestock provides 7% to 9% of the National Agricultural GDP, and 30% of meat supply in homes (Awuni 2003).

For example, in the Northern Region of Ghana, livestock is a replacement and cushion against lack of food, providing money and is also important in the socio-cultural activities of the indigenous people (Awuni 2003). There is approximately 75% and 45% of the nation's herds of cattle and small ruminants respectively in Northern regions of Ghana (Koney 1992). The Government of Ghana through the Ministry of Food and Agriculture has developed a livestock production project specifically in Northern Ghana to provide upgraded breeds of animals to rural communities to fight against poverty. Despite the several outcomes from livestock, the insufficient animal feed at certain times of the year negatively affects the continuous supply of these benefits. The annual growth rate of free ranging ruminants is limited by forage quality and quantity during the dry season (Hofmann 1989). The use of grass, forbs and browse as supplementary feed is the key remedy to a major problem of livestock production in the region. Studies carried out shows an identification of browse species (Asante et al. 2002). However, little information is available about the indigenous grasses/forbs and browse species, consumed by livestock.

1.1. Literature review

Livestock production plays an active contribution in developing countries and is vital to small scale farmers' sustenance of families (Mamabolo & Webb 2005). It provides a critical part in the farming as a danger confronting the choices in farm diversity.

The production of livestock in Ghana, contributes in meeting food needs and provides monetary returns. While the bulk of rural households keep some sort of livestock, commercial farming has become common. Each of Ghana's regions has a favoured livestock production: chicken farming dominates the Southern region; cattle production is centred in the Northern Savannah zones; pig farming is common in the Accra and Ashanti regions; sheep and goat production is prevails in every region (Awuni 2003). Rearing livestock in Ghana can be a fruitful practice only if the livestock is housed, fed and vaccinated accordingly.

According to Komwihangilo et al. (1995), browses and shrubs are of much importance in livestock feeding, especially in arid and semi-arid areas. Feed shortages with respect to quantity and quality during the dry season creates a major threat to Livestock production system in the Greater Accra region (Oppong-Anane 2013). This threat together with high disease occurrence and mortality contributes to low livestock yield.

Bush fires and a fall in nutritional gains of fodder makes it demanding for livestock to meet their nutritional need in the dry season under the extensive and free-range management systems adopted by several farmers. Indeed, many of the animals raised in Ghana endure mainly on farm residue during the dry season. This situation has been identified to result in periodic body weight gain in the rainy season and weight loss in the dry season (Annor et al. 2007). These outlined challenges have made feed for livestock the main short fall which needs to be dealt with in order to boost productivity in small holder systems. This also results from insufficient investigation, high-tech feed mediations and other pertinent challenges, and therefore livestock productivity remain low (Duncan et al. 2012). It is therefore important to entirely figure out everything related to feed constraints to facilitate

the improvement of a favourable and continual high-tech mediations to tackle the matter. This has called for an accurate investigation into livestock production systems to establish the challenges that can be tackled along with feed-related problems.

1.2. Livestock numbers

There has been a steady increase in the number of the various species of livestock from 2006 to 2010 at yearly growth rate of 1.13% and 10.08% for cattle and poultry respectively in Ghana (FAO 2011).

Table 1. Livestock numbers trend (numbers expressed in 1000 animals).

Species	Year					Annual growth rate %
	2006	2007	2008	2009	2010	2006 -2020
Cattle	1 392	1 407	1 425	1 438	1 454	1.13
Sheep	3 314	3 420	3 471	3 642	3 759	3.36
Goats	3 997	4 196	4 305	4 625	4 855	5.37
Pigs	477	491	520	521	536	3.09
Poultry	34 030	37 038	39 816	43 320	47 752	10.08

Source: (FAO 2013)

The annual growth rate of livestock population expressed in livestock unit (LU) from 2006 to 2010 was recorded to be 4.2%. The maximum and minimum growth rates were recorded for poultry and cattle respectively (FAO 2013).

1.3. Socio-economic characteristics

The contribution from livestock to Ghana's agriculture, especially poultry, is very important and cannot be underestimated. The addition to Ghana's agriculture is approximately about 6.1% to agriculture GDP with a growth rate of 4.7% (MOFA 2011). This excludes secondary products, such as manure, animal traction and transport which are offered to the crop sector. Apart from meat, milk and eggs, which are a source of protein to human nutrition, other products from livestock are skins, bones, blood and horns.

Livestock manure is now a rich by product vital to crop and vegetable farmers for soil fertility and structure. In Sudan and specifically the Guinea Savannah ecological zones, the use of traction livestock such as bullocks for land preparation enables farmers to till at a lower cost, as compared to the use of tractors. Agriculture also contributes a lot to the employment sector, particularly in the rural areas. It offers for wealth creation, proceeds enrichment and progress in rural livelihoods (Oppong-Anane 2010). Out of the 2,700,000 farm households in 2006, 1,500,000 kept livestock. Livestock therefore provides cash resources to these farmers during the non-farming season and this saves them from their financial difficulties.

1.4. Farming systems

Ghana has seven agro-ecological zones (Figure 1). Ghana's agriculture is largely smallholder, traditional and rain-fed, and the farming systems differ with agro-ecological zones. However, certain basic features are distinguishable throughout the country. The bush fallow system succeeds wherever there is abundance of land to allow a plot to be rested enough to regain its fertility after one to three-year of cultivation. Staple crops are often mixed-cropped while cash crops are usually mono-cropped. Although the majority of rural households keep some sort of livestock, livestock farming is adjunct to crop farming.

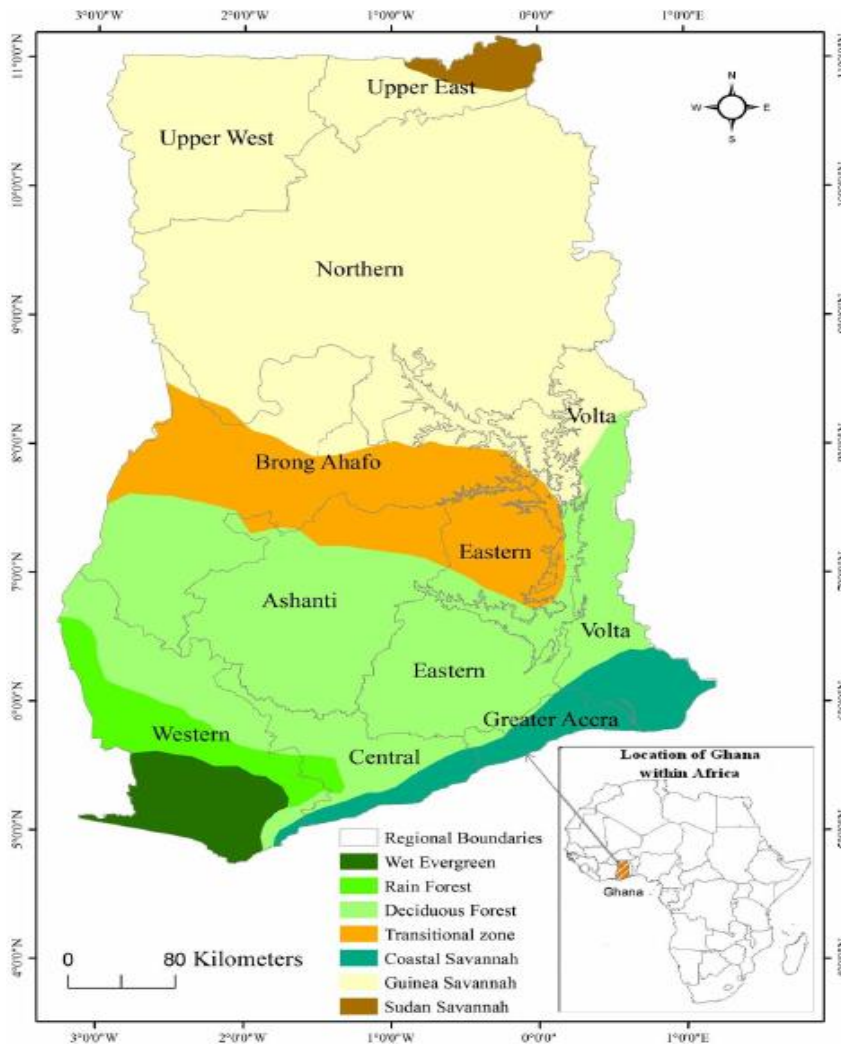


Figure 1. Agro-ecological map of Ghana.

(Source: Map produced by editors based on data compiled by SRDA 2001)

About 74% of the rural households plant crops and rear some livestock. Mixed farming (crop-livestock system) is the commonest farming system nationwide, and this system is mostly practiced in the northern Savannah zones. It was recorded in 2008 that, only 5% of the households in the Sudan Savannah zone undertook started raising livestock or cropping alone (Oppong-Anane et al. 2008).

1.4.1. Non-ruminant livestock

1.4.1.1. Poultry

Many species of poultry are kept in the rural areas, and a few in urban households under semi-intensive production system for home consumption and the excess is sold out or used as barter trade. Not much provision is made for housing, healthcare, feeding and breeding in the management of these animals. Bird mortality is high as a result of the poor management practices in this system. This usually results in viral diseases. Intensive poultry keeping, remains is the best in the country, and it achieved in the peri-urban areas in the Coastal Savannah and Forest zones (Oppong-Anane et al. 2008). The poultry industry has two major lines of production, specifically the layer production for eggs and broiler production for meat, and these lines of production are highly capital intensive with effective management. The prices of material inputs such as fish meal, soymeal, minerals and vitamin premixes are resolved by the exchange rate. Huge quantities of yellow maize are imported to boost the local supply. With the high interest on bank loans, exchange rates, the local farmers find it difficult importing production materials to augment the local materials (Oppong-Anane 2010).

Several approaches useful for smallholder poultry production differ from those used in intensive production system; the target must be on increasing indigenous breeds while using the pure exotic and crossbred chickens for improvement (Kitalyi 1998). Upgrading and crossbreeding with exotic breeds are some efforts put in place to increase productivity (Kitalyi 1998). There has been few studies on local poultry, even though the number of these local birds are usually more than commercial chickens in many developing countries (Cumming 1992). Horst (1988) reported that local breeds of chicken continue to contribute to meat and egg supply in developing countries, although there are high yielding exotic stocks.

1.4.1.2. Pigs

Local pigs are underutilised even though they have the potential to contribute to meat consumption and improved livelihoods in the smallholder communities (Styger 2002). There are several reasons why local pigs are side-lined. First, there are negative perceptions about both the pig and the production environment arising from historical biases against the local pigs and free range production systems (Lekule & Kyvsgaard 2003). Second, farmers lack access to markets, viable marketing strategies and marketable products (Ramsay 2002). Third, there is a general lack of information with regards to carcass, meat and processing quality of local pigs (Styger 2002). Fourth, there are biases in the carcass grading schemes due to historical focus on lean, specialised breeds such as the Large White, which penalise the relatively fat local pigs (Chimonyo & Dzama 2007).

The reasons above are mainly driven by lack of information on the production potential, profitability and meat quality of local pigs raised under free range systems (Ruane 2000),

Semi-extensive pig production thrives well in the rural areas. This system based primarily on the indigenous Ashanti Black pig, which is domesticated all over the country and constitutes about 70% of the national pig population. Crosses between the indigenous and exotic breeds are also used in this system. Pigs are kept in sty and given essential feed based on kitchen waste, and particularly fresh and boiled cassava and cassava peels. In some other instances, the pigs are allowed to roam in search for feed (Oppong-Anane 2010). For the adoption of the intensive pig production system exotic breeds such as Large White and Landrace and their crosses are reared. The system is practiced mainly in the southern areas of the country. This system is highly commercialized and may be classified as small, medium or large scale. The expansion of the intensive system appears to alternate with a fast rate of escalation which happens when there is a deficit of maize and this forces some poultry producers shifting to pig farming (Oppong-Anane 2010).

1.4.1.3. Grasscutter (Cane rat)

In West Africa the livestock is referred to as grasscutter because it feeds mainly on grass by cutting it, while in the Southern parts of Africa, it is called Cane rat because they are usually found in sugarcane plantations (Asibey 1974).

Rearing grasscutter in Ghana is an economically viable investment to farmers and research shows a beneficial return, a financial analysis by Tutu et al (1996). The research also reports that small scale grasscutter farming in Ghana reaps good returns followed by poultry and rabbit. The grasscutter domestication is common now in all parts of the country and there is a big demand for the meat in both rural and urban centres of Ghana (Annor & Kusi 2008; Karikari & Nyameasem 2009). The rodent, a monogastric herbivore like the rabbits and some other rodents. It converts feed well and usually adopts coprophagy (Hemmer 1992). The meat is highly priced source of protein and an agricultural pest of cereals, tuber crops and others (Yeboah & Adamu 1995). The giant cane rat can also be found in any where there is dense grass, especially reedy grass growing in damp or wet places (Ajayi 1971; Abioye et al. 2008). Their numbers in specific areas is determined mainly by the availability of grass species for feed (NRC 1991).

Similarly, in Ghana, the grasscutter is predominantly found in forests where there is intensive plantations of maize, cassava, sugarcane, young cocoa, coconut, oil-palm, pineapple and eggplant (Asibey 1974). Problems such as lack of assistance on proper management practices, housing design, dry season feeding, and acquiring of foundation stock are some factors fighting against its adoption in Ghana (Adu et al. 1999).

1.4.1.4. Rabbit

According to Fayeye and Ayorinde (2003), the increase in human population especially in developing countries, with the inadequate supply of animal source of protein from livestock species like (cattle, sheep, goats, pigs and poultry) has made it important that attention be given to other micro-livestock such as rabbit. Rabbit production has the potential to ease the problem of inadequate animal protein supply in developing counties. Its meat is highly

digestible, tasty, and low in cholesterol, with high protein content (Herbert 2011). Rabbits, because of the enormous benefits associated with their production, and with the belief that the unconventional livestock will certainly bridge the animal protein gap being experienced by man, it is imperative to give available rabbit breeds the needed attention just like other animal genetic resources so as to have more animal products that could supply the immediate needs of man. The litter size at kindling and the survival of the bunnies till weaning age, is dependent on the production efficiency on commercial farms (Odeyinka et al. 2008). Production has a direct relation with the reproduction; the reproductive performance of rabbits is an important condition in determining the profitability of commercial rabbit rearing. Factors such as breed, season, age, and weight of females, according to Lazzaroni et al. (2012), influence the reproductive performance of animals. Among the available adaptable foreign breeds of rabbits reared for meat production in Ghana are Flemish Giant Chinchilla, New Zealand White and California White.

1.4.1.5. Fish

Fisheries resources provide food, income and employment for people in many parts of the world (Bledar 2007). In Ghana, the fisheries industry is estimated to contribute 4.5% to the national GDP and employs an estimated 2,000,000 people (Kwadjoss 2009). The country is considered one of the highest fish-consuming countries, with an average annual per capita fish consumption estimated at 23 kg, which is higher than the World average of 13 kg (FAO 2004).

A lot of people are engaged in aquaculture, especially through the awareness creation efforts of the Directorate of Fisheries. Most fish farmers in Ghana use earthen ponds and rely on natural productivity to feed fish, while others supplement feed with agricultural by-products (FAO 2006–2012). Pens, on the other hand, are relatively a new production system to Ghana. Pens are generally built in large open waters such as lakes, reservoirs and rivers. Fish pens are distinguished from a fish cage, which is defined as an enclosure with bottom and sides of netting or bamboo, etc., whether floating at the surface or totally submerged. The continued growth and development of aquaculture production will be dependent on

its ability to make profits. Therefore, measuring current and past profitability and projecting future profitability as well as the associated risks are of great importance to current and prospective entrepreneurs and likely financiers. As the aquaculture sector is expected to contribute towards economic growth, food security and poverty alleviation of present and future generations of Ghanaians, it is expedient to examine the profitability of aquaculture to identify possible areas that require improvement.

1.4.1.6. Snail

According to Asamoah (1999), snails are highly consumed by a majority of the Ghanaian populace. The meat is socially well accepted in many parts of Ghana. Its tenderness and fine texture make it the most suitable meat for all ages (Agbogidi & Okanta 2011). Traditionally, snail meat has been a major ingredient in the diet of people living in the high forest zone (Agbogidi & Okanta 2011) of which the actual protein consumed by these rural people is not sufficiently supplied by crop production (Ajibefun 2000). The meat provides an excellent source of protein in the diet of rural and urban poor households in Ghana (Blay et al. 2004) with protein content being higher than that of conventional food animals (Wosu 2003). Snails have high medicinal values that help in the prevention and curing of cardiovascular diseases such as hypertension, kidney diseases, tuberculosis, anaemia, diabetes and asthma (Baba & Adeleke 2006). It is also believed in Ghana that, the bluish liquid obtained when the flesh of a snail is removed from its shell is good for infant development (Cobbinah et al. 2008). Like many other agricultural activities, production of snails provides some economic benefits to the peasant farmers in rural areas (Agbogidi et al. 2008).

Snail meat is very common in Ghana, and therefore its production cannot be overestimated. Start-up capital for their production is low due to their feeding, raising on a small area of farm size and the use of local tools, and farm products (Asamoah 1999). Snails are usually found on along roadsides, footpaths and also backyards in villages. They can be fed with pawpaw (leaf or fruits), cocoyam leaf and vegetables (Baruwa 2012), household and market waste (Zwuen et al. 2013).

However, attention has not been paid to snail production in Ghana which is also a source of income to the peasant farmers (Agbogidi & Okanta 2011). Peasant farmers are intensively depending on crop production as their main source of income and protein supply, mean while there are opportunities to snail production in Ghana.

1.4.2. Ruminant livestock

1.4.2.1. Sheep and Goats

Small ruminants such sheep and goat form an important ecological niche in small farm systems; they are distributed over all types of ecology in the tropics and dry zones of developing countries (Devendra 2001). Sheep and goat are kept in different production systems, such as intensive and extensive. Others adopt the pastoralist system, smallholders, and minor areas where it is the only source of protein and means of livelihood for the people (Devendra 2007).

Sheep and goat farming system, is widely identified as traditional for the production of small ruminant. The production system mainly relies on free grazing flocks of Djallonké sheep, while goats usually show a low yield. Diseases, mostly helminthiasis and pests of ruminants, are the main sources of low productivity and increased mortality among these animals. This system is gradually growing into semi-intensive system throughout the country (Oppong-Anane 2010).

The sheep and goat semi-intensive system require that pens that are not complex are prepared for the animals in the owner's house. The system is established on the cut and carry of forages, and the use of household wastes, most especially kitchen waste like cassava and plantain peels. Other crop residues and crop by-products can are also used. The intensive system is somehow related to the semi-intensive except that in intensive system all the feed is provided in the pen. This system is greatly practiced in the peri-urban areas, and in particular the "Zongo" communities constituting a large number of Hausas, and the Northern Ghana extract. It supplies fattened rams and bucks for the urban markets, especially during religious festivities of Muslims. The intensive system adopts the

crossbreeding of the Djallonké sheep and goats with the long-legged and large Sahelian sires (Oppong-Anane 2010).

1.4.2.2. Cattle

Beef cattle farming system is the major cattle production system practiced in Ghana and the animals are raised mainly on extensive grazing by smallholder herds. This system has a connection with milk production, where milk is shared between the herdsman and the calf, and the excess is sold in markets. Cattle farmers sometimes incorporate crop cultivation to the animal rearing. Ownership may be direct, personal and individual, or in the form of custodian for family ownership. When there is a large herd, the family groups owning them are usually many, ranging in the size and in their relationships. Commercial cattle rearing is mainly practiced in the Northern Savannah zones with distinguishing levels of management which are more intense than the extensive production system. Sometimes the cattle are owned mainly by wealthy individuals who live outside the production areas with little or no involvement in the management of these ruminants. There are some few state farms under the intensive production system. Cattle may graze on cultivated or natural pastures, which may be also developed with forage legumes (Oppong-Anane 2010).

Approximately, 90% of milk production comes from agro-pastoral herds. Milk yield in the dry season is low as compared to the rainy season; about 0.8 and 0.4 litres/cow/day in the rainy and dry seasons respectively. The local breeds of cattle used in Ghana have a poor genetic ability for milk production. Even when the best feeding and husbandry conditions are provided, animal are not able to perform up to expectation. In the Greater Accra and Eastern regions (Coastal Savannah zone) households keep between one and six dairy cows at their backyards on commercial basis with some breed like Friesian - Sanga crossbreds or Jersey cows all summing up to about one hundred (Oppong-Anane 2010). For every household that has been in the dairy business for over fifteen years using Friesian - Sanga crossbreds, they feed the animals on forages, wheat bran, palm kernel cake, cassava peels and cassava leaves. The cows produced on the average 2,700 kg of milk per lactation (Oppong-Anane et al. 2008).

Smallholder dairy herds in the Accra contribute to the dairy industry in Ghana (Okantah, 1992). Studies by (Gyawu & Owusu 1988; Karikari et al. 1994) indicate that the reproductive performance of common breeds of cattle like N'dama, West African Shorthorn and Sokoto Gudali in Ghana are ideal is less than optimum. This is characterized by late age at puberty and calving, low conception rates and long post-partum anoestrous intervals, leading to prolonged calving intervals. Cattle farmers in Ghana use large-sized animals and attention has been directed towards the use of the Sanga breed, a crossbreed between the Zebu and the West African Shorthorn. Although Sanga constitutes 76% of cattle used for milk production in smallholder dairy herds in Accra (Okantah 1992), but there is little information on their reproductive performance.

1.5. Livestock feeding

Non-ruminant livestock production in Ghana is critically inhibited by the inadequacy of feed of good quality and availability. The intensive systems of poultry and pig production is the only livestock system that tend to feed adequate rations for productivity. Very intense lack of feed occurs in this intensive rearing systems due to the high rise in the prices of maize and other primary feed ingredients, also including other agro-industrial by-products, thus hiking the expenditure of poultry and pig production (Oppong-Anane 2010). The Ghana Feed Millers Association (GFMA) under which some commercial feed millers belong, supply poultry feed mostly to the medium- and small-scale poultry producers. The large-scale farmers prepare their own feed. Some few pig farmers obtain their feed from the commercial feed millers, having switched to on-farm feed production to cut down on feed cost. The commercial feed millers produce mainly mashed or pelleted feed, while a few produce concentrates. Small and medium-scale poultry farmers prefer to feed concentrates because it is cheaper and less bulky for transportation.

Commercial feed millers produce approximately 90% of layer feed. Broiler feed is primarily purchased by small-scale backyard poultry producers. However, during the Christmas and Easter festive season, there is a demand for poultry feed. About 70% of poultry feed

accounts for the overall feed produced in Ghana (Oppong-Anane 2010). The GFMA provides the livestock industry with quality and affordable feed.

The major cost item in non-ruminant intensive system is feed; conservatively this contributes between 60% and 75% of the total production cost. The main ingredients for non-ruminant feed is maize, which is locally produced, even though it is insufficient to meet the all year-round demand for the poultry industry. Therefore, yellow maize is commonly imported to add up to the local supply (Okai 2010). Maize forms about 50% to 60% of the compound feed with poultry industry and consumes about 30% percent of all maize produced in the country. Feed prices in Ghana keeps increasing, mainly due to the rising cost of maize. The government of Ghana periodically approves of the importation of yellow maize due to the high cost of white maize. Attention is now being focussed on the use of Agro-Industrial by Product as alternative to the expensive maize as energy source in livestock feeding. This is particularly so with pig farmers. Shockingly, cassava which has been shown to be a suitable partial substitute to maize in livestock feed is not being fully exploited for feeding non-ruminants in Ghana. This could be as a result of its high-water content in the tuber. Cassava tuber is low in protein content and rich in crude fibre. This therefore contributes to its low usage as livestock feed in the country especially for poultry.

1.5.1. Feedstuff and feeding

Survival rate for cattle in Ghana, and small ruminants, depends almost on grazing of natural pastures and rangeland. These pastures maybe of Savannah pastures and undeveloped pastures which form about 45% of the total land area (MOFA 2011). Some farmers supplement other feedstuff, using crop/farm residues such as cassava peels and cassava leaves as well as cut forages particularly during the dry season. In the more humid areas, livestock have plenty of crop residues to feed on but their availability is irregular, and they become scarce during the dry season. Ruminant stocks are fattened with additional feed inputs for high pricing, again during festive seasons. The bulk of the feed in the extensive production systems lack adequate nutrients for satisfactory productivity. Supplemental feeding is of much essence in these system of production. In communities where cropping

is practiced, sheep and goats are left to roam only after the crops have been harvested to avoid damage to crops. On the other hand, they are tethered and allowed to graze in defined areas. These ruminants are however, moved to different areas daily to in the search for enough ensure forage to feed on (Oppong-Anane 2010).

1.5.2. Livestock nourishment

Meeting livestock nutritional demands is highly important for maintenance, proper growth, finishing and breeding. An excellent nutritional plan must include sufficient intake of amino acids, carbohydrates, fatty acids, minerals, and vitamins through a supplementary feeding. Also, water is very important in animal. Livestock may have health problems as a result of poor quality water, as water consumption is more important feed consumption. Therefore water quantity and quality is key. If livestock do not drink enough safe water daily, intake of feed (roughages and concentrates) will decrease, and production will decrease as well (FAO 2011).

1.5.3. Crop debris and household waste

In West Africa, the cultivation of various crops, such as food crops (maize, sorghum, cassava, plantain) or tree crops (cocoa, oil palm, rubber) during the humid season is fundamental in farming system. Many of these crops undergo primary processing, either at the homesteads or farmsteads, thus producing a substantial amount of crop residues. Unlike browses, which tend to have medium to high nutritional values and hence complement poor quality forages, the nutritional value of crop residues could vary from high to low levels, similar to those of poor quality forages (MOFA 2011).

Many crop residues are low in protein, are highly fibrous and, therefore, low in fermentable carbohydrates. Such feeds fail to maintain an efficient rumen ecosystem for their own degradation and/or that of equally poor forages. Theoretically, but also from practical observations, it has been suggested that the characteristics of a maintenance diet for adult ruminants are a crude-protein level of 6% to 7%, a dry-matter intake of about 1.7% of body weight and a dry-matter digestibility of 50% to 55% (Devendra 1985). Such residues may

require upgrading by chemical, physical or biological treatments to improve their value and usefulness. Such analysis may, however, not be suitable for small-scale small-ruminant production systems.

Table 2. Major agro-industrial by-products production by ecological zones.

Feed Resource	Sudan Savannah	Guinea Savannah	Derived Savannah	Forest	Coastal Savannah
Wheat bran				✕	✕
Rice bran	✕	✕	✕	✕	✕
Maize bran	✕	✕	✕	✕	✕
Millet mash	✕	✕	✕		
Pito mash	✕	✕	✕		
Brewers spent grain				✕	✕
Spent yeast				✕	✕
Oil seed cakes	✕	✕	✕	✕	✕
Coconut chaff				✕	
Cassava tuber & peels		✕	✕	✕	✕
Cottonseed cake		✕	✕		

Source: (Oppong-Anane 2010). Blank spaces shows that the feed resource is not used in the specified Agro-ecological zone.

Whereas crop residues (cereal straws, stovers) may not be suitable as supplements to poor quality forages, they could be used as basal feeds, supplemented with better quality feed materials such as browses.

1.6. Some challenges faced by livestock farmers in Ghana

1.6.1. Health

Challenges affecting livestock production in Ghana includes prevalence of diseases and parasites, especially in more humid areas. This causes high mortality amongst young livestock, reducing the outcome of their high reproductive performance.

Parasitism is ranked higher among the factors that limit the productivity of livestock. Helminthiasis was the most prevalent condition encountered. Assoku (1980) reported on the helminths of sheep and goats in the Accra plains of Ghana. He found that 80% and 88.3% of sheep and goats were infected respectively. Parasitism increases especially amongst livestock reared under the traditional system. This increases infestation and makes control measures difficult. Young animals are affected and parasites cause other conditions such as nutritional stress (Kone 1992).

Some other diseases that affect the productivity of livestock include pneumonia, coccidiosis, ecthyma and brucellosis. High standards of sanitation and good management are essential to control disease.

1.6.2. Nourishment

Insufficient feeding is a major factor to small scale livestock production in tropical Africa. When there are no rainfall nutritional value of fodder is poor. The management system is nomadic or transhumant pastoralism. Animals have to walk long distances in search of fodder and water. In humid and sub humid areas, there can be drought for about six months within the year, resulting in poor quality forages. A variety of grasses and legumes have been used to improve pastures and high yields have been recorded (Oppong-Anane 2010).

Crop residues also is one good alternative source of feed in the dry season. Their feeding value and dry matter production can be improved if the crops are planted with forage legumes.

1.6.3. Farm management

Livestock in tropical Africa are kept under traditional extensive systems. In the arid and sub humid zones, cattle are reared with sheep and/or goats. Livestock graze freely, with access to household and kitchen wastes when available and supplemented with grazing on low quality forages or browses. Some animals, such as goat, sheep and cattle are sometimes tethered and fed with cut forage or farm wastes supplemented with zero-grazing.

Small scale livestock management under traditional systems has the following characteristics (FAO 2011):

- (a) Owners are usually crop farmers for whom livestock keeping is of secondary importance.
- (b) Most farmers keep only a few sheep and goats, also keeping other livestock such as pigs, chickens.
- (c) Veterinary and livestock improvement services are minimal.

These management practices are not ideal. Mortality rates (particularly amongst the young) and losses from accidents, theft and predators are high. Research innovations and extension services have little impact on the production systems, and the benefits of livestock production system are lost.

2. Aims of the Thesis

The aim of this study was to;

- i. Determine livestock and mini-livestock species diversity and numbers, to evaluate management of small-scale farms in relation to nutrition and feeding of animals.
- ii. Further aim of the study is to determine the source of feeds and define feedstuff costs.

The specific objectives was to;

- i. Determine the characteristics of livestock farmers.
- ii. Determine feed availability and measures taken to alleviate feed shortages.
- iii. Determine main constraints faced by farmers.

3. Methods

3.1. Study area

The study was undertaken in the Greater Accra Region of Ghana, where the capital of the nation, Accra, is located. It is the smallest in terms of land size among the ten regions of Ghana, though it is very important in poultry and pig production in Ghana (Awuni 2003). The second largest in terms of regional population in Ghana and also constituting the region with the majority of middle class (GSS 2012). With a prevailing lowland and savannah grassland vegetation and connected with an annual temperature that ranges from 20°C to 30°C (MLGRD 2006), making the region very suitable for livestock production.

The main focused area in the region for this study was the Ga East District of the Greater Accra Region of Ghana. This area was selected due to the presence of numerous small-scale livestock farms. The District office of the Ministry of Food and Agriculture was consulted to obtain background information about small-scale farms in the area.

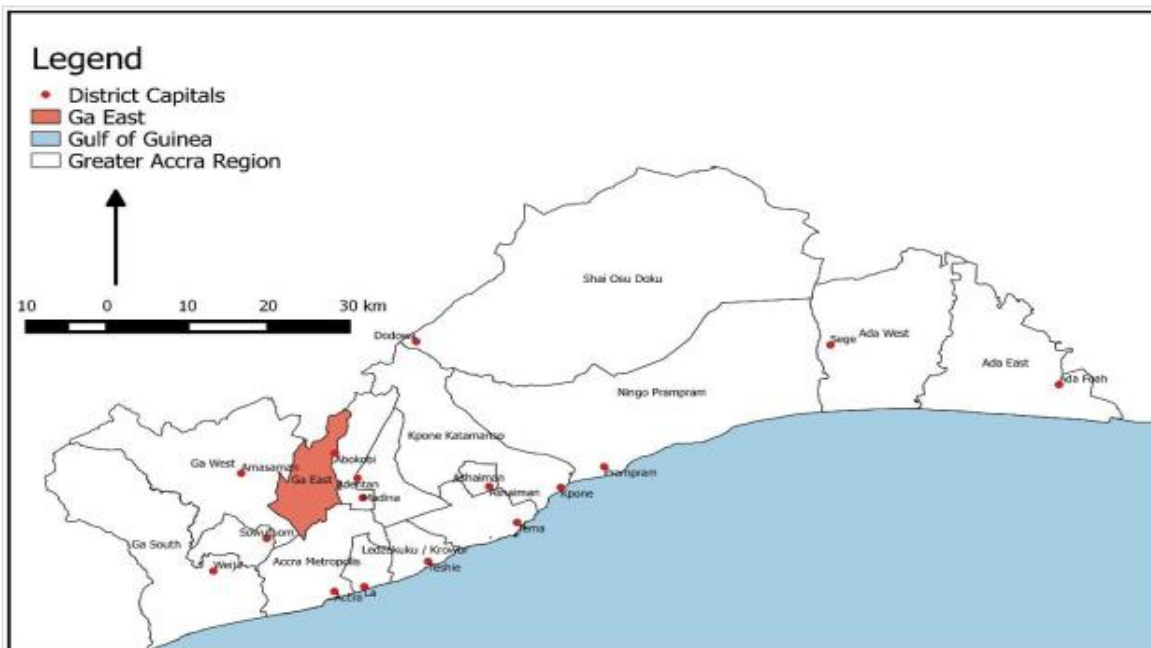


Figure 2. Map of Accra showing all 16 districts.

(Source: GSS 2012)

3.2. Location and Climate (Ga East District)

Ga East District is located at the northern part of Greater Accra Region. It is one of the 16 Districts in the Greater Accra Region and covers a Land Area of about 96 sq. kilometres. The capital of the District is Abokobi. It shares boundaries with Ga West District to the west, La-kwantanang District on the east, Accra Metropolitan Assembly to the south and on the north by the Akwapem South District.

The District lies in the savannah agro-ecological zone. The average annual temperature ranges between 25.1 °c in August and 28.4 °c in February and March. February and March are normally the hottest months. The District has two main vegetation namely shrub lands and grassland (MLGRD 2006).

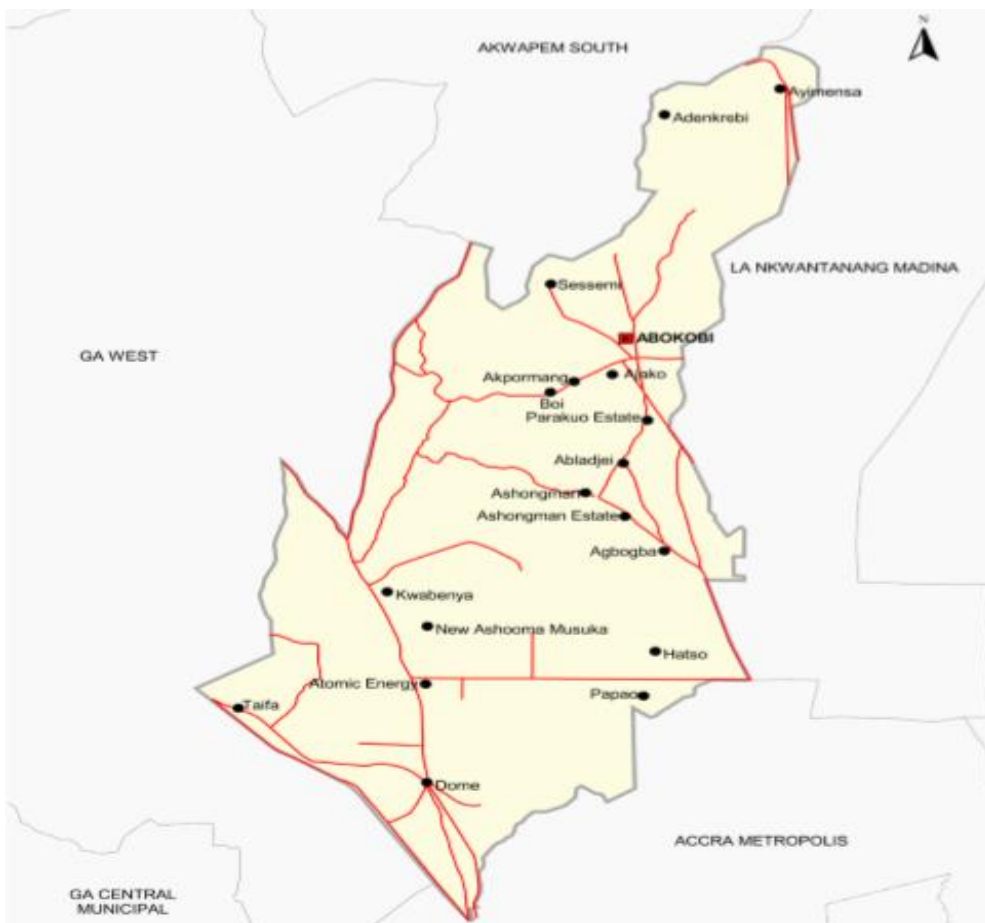


Figure 3. Map of Ga East district.
(Source: GSS 2012)

3.3. Data collection

Data collection was carried out between July and August, 2017. Respondents were interviewed with the use of semi-structured questionnaires (see Appendix 1). The questionnaires was prepared in English, and for easy communication and appropriate responses, the interviews were interpreted in 'Twi' to local farmers.

30 small-scale livestock farmers were selected from ten communities (Abokobi, Agbogba, Ashongman, Dome, Haatso, Kwabenya, Oyarifa, Pantang, Taifa, Teima) using the snowball sampling technique. Personal observation was also used for plant feedstuff identification. Feed samples were collected and taken for plant identification with the assistance of a Botanist from the University of Cape Coast.



Figure 4. An interview with a farmer.

Photo by: Jana Kalitová

3.4. Analysis

Data gathered from the respondents were analyzed via descriptive statistics such as means, frequencies and standard deviation. The results are presented in tables and figures. MS Office Excel version 2013 was used for data entry and analysis.

4. Results

4.1. Livestock species, breeds and numbers

Respondents were engaged in poultry, pig, cattle, goat, sheep, grasscutter, rabbit, fish and snail rearing. They kept either one or more species. The results showed that 17 respondents kept only one species; six kept poultry, two kept fish, one kept cattle, one kept sheep, four kept pig, and three kept grasscutter. Four respondents kept only two different species; one farmer kept sheep and goat, the other rabbit and grasscutter, another kept pig and poultry, and one other farmer kept cattle and sheep. Nine respondents kept two or more different species; the species raised among this group of respondents was a combination of snail, pig, poultry, rabbit and goat. The breeds of the various species were either local or imported. Regarding the breed of livestock species kept, 16 respondents kept only one breed of livestock species, nine kept two different breeds of each livestock specie, while five kept two or more breeds of livestock specie raised. For pig, poultry, and rabbit farmers, they raised imported breeds of livestock. The goat, sheep, cattle, snail, fish, and grasscutter were all local breeds.

Table 3. Breeds of livestock identified and their average number per farmer.

Livestock	Breed	Mean	Number of respondents
Goat	West African Dwarf, Sokoto red	23 (± 3.74)	4
Sheep	West African Dwarf, Nungua blackhead	11 (± 2.16)	4
Cattle	White Fulani, N'dama, Sanga	43 (± 29.70)	2
Pig	Large white, Landrace, Ashanti black	66 (± 19.91)	7
<i>Poultry;</i>			
Chicken	Lohmann Brown, Lohmann LSL classic, white leghorn	1,800 (± 554.53)	10
Duck	Muscovy	29 (± 7.07)	2
Guinea fowl	Helmeted guinea fowl	100 (± 28.28)	2

Turkey	Bronze turkey, Broad Breasted White Turkey	50 (± 10.00)	3
Geese	African geese	9 (± 7.07)	2
Rabbit	Flemish giant, Chinchila, White and grey checkered, White New Zealand	40 (± 19.42)	4
Grasscutter		12 (± 4.95)	5
Fish (catfish)		500 (± 141.42)	2
Snail	Giant tiger land snail	107 (± 7.07)	2

The local breeds identified were West African Dwarf, Sokoto red, West African Dwarf, Nungua blackhead, White Fulani, N'dama, Sanga, Ashanti black, Giant tiger land snail, helmeted guinea fowl, African geese, Catfish and grasscutter (*Thryonomys swinderianus*). Imported breeds were Large white, Landrace, Muscovy, Flemish giant, Chinchila, White and grey checkered, White New Zealand, Lohmann Brown, Lohmann LSL classic, white leghorn, Bronze turkey, Broad Breasted White Turkey.

4.2. Management

Respondents fed their livestock on feed materials available. Farmers did not have a good system of record keeping. A typical example was that farmers did not keep records of the quantity of feed fed to their livestock and farming expenses. Given that most farmers in this study did not keep records, it was important to investigate why many farmers did not feel it was important to keep farm records. Table 4 displays the reasons given by farmers for not keeping records.

Table 4. Distribution of reasons for not keeping farm records.

Reasons	Respondents
Do not know how to keep records	2
Have no need for records	17
Have no time for record keeping	11

The responses shows there were three reasons why respondents did not keep farm records. In the case of two respondents (with no education) they did not keep records because they could neither read nor write. In the case of the other twenty-eight respondent who had some form of education, the reason for not keeping records was that they saw no need or had no time for records.



Figure 5: Housing structure for rabbits and grasscutter.

Photo by: Author

The livestock were bred in a variety of housing units, the commonest being a hutch comprising a wooden frame with welded mesh for rabbits and grasscutter. Sheep and goat were raised in pens fenced with wire mesh, with cattle in Kraal fenced with wood. Fishes were raised in earth ponds and snail were housed in concrete cages built within the soil. Poultry farmers with large flock housed their birds using the deep litter housing unit, and farmers with small flock housed them in coops. Pig farmers housed their livestock in a sty with concrete floor and a shed.

4.3. Source of feed (plant) species used by farmers

A total of 21 plant species were identified. Table 5 indicates all the species identified.

There were two categories of feeding systems observed in the study; non-ruminants (pig, poultry and fish) fed on plants and industrial waste such as sorghum malt and soya. Ruminants (as well as non-ruminant herbivores) fed solely on plants. Farmers cut the plant from wild pastures or crop residue and fed to their livestock. Poultry and fish farmers purchased formulated feed from feed mills. Pig farmers fed livestock with industrial waste from manufacturing industries and with plant sources. The feed were formulated with local and imported ingredients (see Table 5). All the ruminants (and herbivores) small scale farmers indicated that they fed their animals with grasses, forbs, browses and supplement species. Source of the plant feedstuff materials were either harvested from cultivated or wild pasture, farm residue, as well as industrial waste such as soya and sorghum malt. The preference of feedstuff fed to livestock was determined by the farmer based on the availability of the feedstuff.

Table 5. Grasses, forbs, browses and supplements species used by livestock farmers.

Common name	Scientific name	Part fed	Livestock	Local Name (Twi)	Source of feedstuff
Grasses					
Guinea grass	<i>Panicum maximum</i>	Leaves	Cattle, goat, sheep, grasscutter, rabbit		Wild
Elephant grass	<i>Pennisetum purpureum</i>	Leaves	Cattle, goat, sheep, grasscutter	Twenata	Wild
Sugarcane	<i>Saccharum officinarum</i>	Leaves stems	Goat, sheep, grasscutter	Ahwerew	Crop residue

Maize	<i>Zea mays</i>	Leaves cobs stalks	Cattle, goat, sheep, rabbit poultry, pig, grasscutter, fish, snail	Aburow	Crop residue
Sorghum	<i>Sorghum bicolor</i>	Seeds	Pig, poultry	Sorghum Malt	Manufacturing industries
Forbs					
Tridax	<i>Tridax procumbens</i>	Leaves	Rabbit, goat, sheep	Tridax	Wild
Pig weed	<i>Boerhavia diffusa</i>	Leaves	Pig, rabbit, sheep, goat, grasscutter, snail	Preko ngura	Wild
Waterleaf	<i>Talinum triangulare</i>	Leaves	Pig, rabbit, poultry, snail	Bokoboko	Wild
Dandelion	<i>Lactuca teraxacifolia</i>	Leaves	Rabbit, snail	Dandelion	Wild
Milk weed	<i>Euphorbia heterophyla</i>	Leaves	Rabbit	Adanko milk	Wild
Soybean	<i>Glycine max</i>	Seeds	Pig, poultry	Soya	Manufacturing industries
Browses					
Mango	<i>Moringa oleifera</i>	Leaves fruits	Goat, sheep, pig	Mango	Crop residue
Moringa	<i>Moringa oleifera</i>	Leaves twigs	Goat, sheep, grasscutter, pig, rabbit	Moringa	Crop residue
Leaucaena	<i>Leaucaena leucocephala</i>	Leaves twigs fruits	Cattle, sheep, goat	Leauceana	Wild

Supplements					
Potato	<i>Solanum tuberosum</i>	Leaves vine	Pig, goat, sheep	Aborɔdwomaa	Crop residue
Pawpaw	<i>Carica papaya</i>	Leaves fruits	Pig, snail	Borɔfere	Crop residue
Pineapple	<i>Ananas comosus</i>	Fruits, crown	Pig, sheep, goat	Aborɔbɛ	Crop residue
Watermelon	<i>Citrullus lanatus var.</i>	Fruits	Pig, goat, sheep, snail	Anamuna	Crop residue
Cocoyam	<i>Colocasia esculenta</i>	Leaves	Snails	Nkontomire	Crop residue
Cassava	<i>Manihot esculenta</i>	Leaves peels	Goat, sheep, garasscutter, pig, rabbit	Bankye	Crop residue
Plantain	<i>Musa acuminata</i>	Leaves peels	Goat, sheep, rabbit	Borɔde	Crop residue

Feed ingredients such as fish meal, vitamins and mineral supplements, as well as premixes, concentrates, complete feeds, soymeal and maize (for poultry and fish feed) were used for feed formulation in the feed mills.

Table 6. Composition of formulated feed for poultry and fish from feed mills.

Ingredients
Maize
Maize bran
Sorghum malt
Fish meal
Soya bean meal
Whole cottonseed
Common salt
Mineral
Vitamin premix
Oyster shells

Of the 21 plant species identified, respondents ranked seven plant species which were highly used according to the preference of respondents. Maize was ranked first. The preference of these plant species depended on its availability; whether during the dry or wet season. The grasses and forbs were abundant in the wet season, and during the dry season the browses and supplements were used.

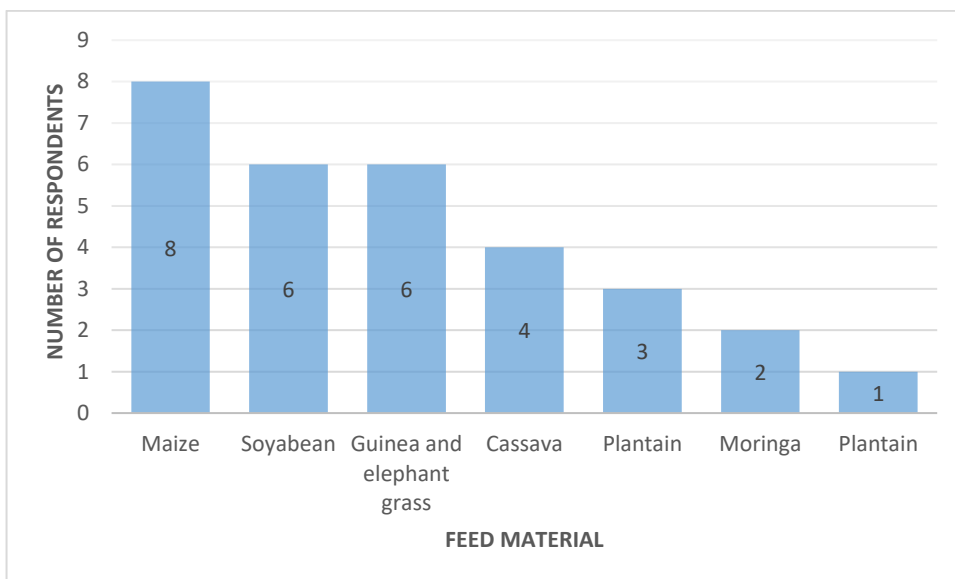


Figure 6: Top seven plant species used by farmers to feed their livestock.

4.4. Feedstuff cost

Respondents, especially ruminant farmers did not spend any amount of money on feeding their livestock, as they fed animal either from crop residue or cut forage from cultivated or wild pastures.

From the study, it was recorded that poultry, fish and pigs farmers were the respondents who spent money on feeding their livestock. For poultry and fish farmers, they purchased formulated feed from feed mills while the pig farmers purchased the waste from manufacturing industries. Pig farmers fed their animals with sorghum malt and soya bean waste from manufacturing companies, and supplemented it with plant sources like pineapple, cassava, watermelon and plantain.

Table 7. Average price list of poultry, fish and pig feed at Greater Accra Poultry Farmers Association feed mill, Kosher Feed mill Limited, Amas Feed mill, Oyarifa Feed mill and Accra Brewery Limited.

Type of Feed (poultry)	Price of feed (GH₵) per Kg	Euro(€) equivalence
Chick Starter	1.62	0.30
Grower Mash	1.42	0.26
Layer Mash	1.73	0.32
Broiler Starter	2	0.37
Broiler Finisher	1.89	0.35
Type of Feed (fish)		
Starter fish feed	9.67	1.76
Grower fish feed	7.67	1.40
Type of Feed (pig)		
Sorghum malt	0.49	0.09
Soya bean	0.49	0.09

It was recorded that 19 respondents, who reared poultry, pig or fish bought feed stuff to feed their livestock. They purchased feed from either manufacturing industry or feed mills. Due to the lack of proper record keeping, farmers could not tell the quantities of feed they buy, say in a month, to feed their livestock. The other livestock farmers; goat, sheep, cattle, rabbit, grasscutter and snail farmers did not buy feed stuff to feed their livestock. Instead they depended on wild pastures or crop residue.

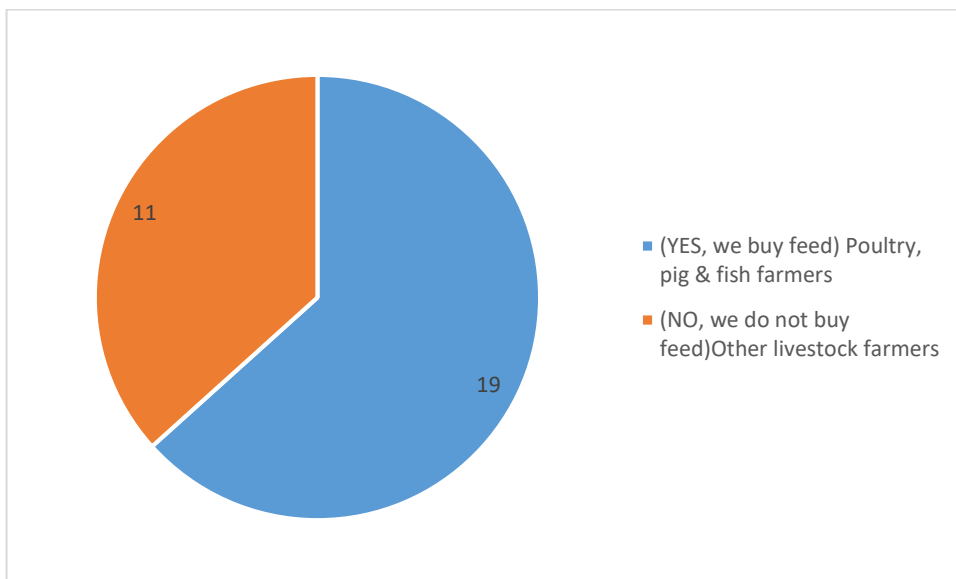


Figure 7. Response to the purchase of feedstuff.

4.5. Characteristics of livestock farmers

The study identified the following socio-economic characteristics.

Table 8. Socio-economic characteristics of farmers (n=30).

VARIABLE	FREQUENCY	Percentage (%)
AGE (YEARS)		
18 – 25	1	3.33
26 – 40	14	46.67
41 – 59	12	40.00
Above 60	3	10.00
GENDER		
Male	26	86.67
Female	4	13.33
MAIN PURPOSE OF PRODUCTION		
Income generation	24	80
Food products to feed family	4	13.33
Off farm (e.g. transport, recreation, sport, research, religion)	2	6.67
FARMING EXPERIENCE (YEARS)		
1-5	16	53.33

6-10	5	16.67
11-20	6	20.00
21-30	2	6.67
Above 30	1	3.33
LEVEL OF EDUCATION		
None	2	6.67
Basic	9	30.00
Secondary	10	33.33
Tertiary	9	30.00
LABOUR SIZE		
1	10	33.33
2	6	20.00
3	7	23.34
4	4	13.33
More than 5	3	10.00
HERD SIZE		
Under 50	10	33.33
50-100	5	16.67
101-150	3	10.00
151-200	1	3.33
Above 200	11	36.67

From the above characteristics, it was reveal that 24 of the respondents were into livestock farming for income generation. Poultry, pig, fish, cattle and snail farmers fell under the category of farmers who raised live for income generation. Four respondents mentioned they were in the venture to feed the family; goat and sheep farmers were in this category. Two respondents, raised their livestock for the purpose of a research: they were rabbit and grascutter farmers.

Table 9. Summary definition of variables and descriptive statistics (n=30).

Variable	Minimum	Maximum	Mean
Farming experience (in years)	1	31	3.78(±1.16)
Age (in years)	18	67	33(±0.73)
Herd size	13	1970	413.60(±545.44)
Yearly profit (in Ghana cedis)	230	3000	944 (±750.41)
Labour size	1	8	2.57 (±1.63)

4.6. Measures taken to alleviate the feed and management constraints

The study revealed that fourteen of the respondents did not incorporate the cultivation of grass, forb or browse species into their farming activities. This response was critical since this affected the rearing of the animal in certain seasons of the year. Table 10 below represents the practices indicated by the livestock farmers to ensure feed availability and the main constraints faced.

Table 10. Practices to ensure the feed availability and main management constraints.

VARIABLE	NUMBER OF RESPONDENTS
<i>Measures taken to alleviate the feed shortage</i>	
Feed preservation as hay, etc.	5
Purchase concentrates	8
Pasture cultivation	3
No measures taken	14
<i>Main constraints</i>	
Health (Disease attack)	8
Feed and nutritional need in dry season	17
Bushfires	5
<i>Main consequence of the feed shortage on livestock</i>	
Weight loss	10

Yield reduction	13
Increased mortality	7

Inadequacies in quality and quantity of feed during certain season becomes a challenge to farmers, and this intend affects the nutrition of livestock all year round. Feeding of livestock especially during drought periods is challenging. Respondents perceived feed scarcity in the dry season as their major constraint and certain measures must be put in place to tackle this challenge during drought periods.

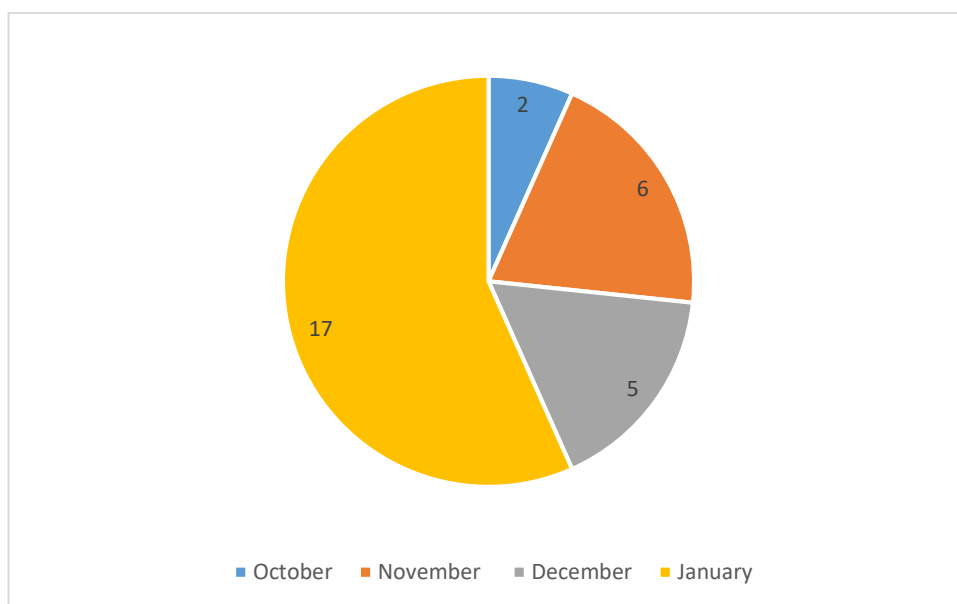


Figure 8. Month of feed scarcity in the year.

5. Discussion

5.1. Livestock species, breeds and numbers

Livestock species populations in 2014 were cattle 1,657,000, sheep 4,335,000, goats 6,044,000, pigs 682,000 and 68,511,000 poultry in Ghana. The population increase of the various species from 2009 to 2014 were cattle 15.2%, sheep 19%, goat 30.7%, pigs 30.9% and poultry 58.2% (SRID 2014). The average growth rate from 2009 to 2014 is cattle 2.88%, sheep 3.55%, goats 5.5%, pigs 5.54% and poultry 9.61%. FAO (2013) data on livestock populations on Ghana's share of species populations are 2.18%, 4.18%, 4.38%, 4.22% and 12.39% percent for cattle, sheep, goats, pigs and poultry respectively. It can be noted that the number of livestock species are steadily increasing over the years. Ruminant livestock herd and flock sizes vary among each farm unit. The average herd and flock sizes in the small scale farming system are as follows: cattle 10, sheep 9, goats 10, pig 8 and rabbit 5 to 25 animals according to MoFA (2011). The mean numbers of livestock in this study did not agree with this findings, as respondents had more livestock compared to the findings of MoFA (2011). The increase in the numbers can be attributed to the fact that farmers are raising more animal in order to raise more income in the district.

Awuni (2003) stated that pig farming is common in the Accra and Ashanti regions, while poultry farming dominates the Southern regions. Respondents were asked the category of livestock they kept and the results showed that poultry and pig (10 and 7 respondents respectively) were the common kind of livestock kept by the farmers in the district; a confirmation to Awuni (2003) findings. Other animals raised are cattle, goat, sheep, grasscutter, rabbit, fish and snail. Breeds of the various species that survived under the environmental conditions prevailing in the study area were identified. The breeds of the species were either from local or imported sources. Local breeds are characterized by small birth rates, low milk yield, slow growth rates and small mature weights (Cumming 1992; Oppong-Anane 2010). For this reason, farmers raised imported breeds which yielded more, and survived under the prevailing environmental conditions. Notwithstanding the low

quality of local breeds, farmers still raised them because they are hardier than the imported breeds.

5.2. Management of animal husbandry

Human capital is a significant asset for agricultural development and therefore, education plays a key role in decision making and the ability to absorb modern agricultural technology and hence has a bearing on agricultural productivity (Asadullah et al. 2005). Furthermore, education enables farmers to comprehend the social and economic factors governing their farming activities. Considering the educational level of respondents, it can be clearly stated that lack of knowledge of record keeping was the main reason (in the case of two respondents) for not keeping records. This was because of illiteracy of the two respondents. The lack of need and time for record keeping, may be associated with the fact that farmers see their operation as a subsistent one, that is to say, they own their own business. If their operations were for commercial purposes, it is more likely they would have seen the need for record keeping. Again the lack of proper record keeping made it difficult to access the quantities of feed livestock farmers fed to their animals. All they could say was that they fed their livestock ad-libitum.

5.3. Source of feed (plant) species used by farmers

Of the twenty one local plant species identified, five were grasses, three browses, six forbs and seven supplement species.

Maize is found in all the ecological zones, notwithstanding cassava tuber and peels is also used in all the zones for feeding pigs, goat and sheep, grasscutter and rabbits (Oppong-Anane 2010). Maize contributes about 50% to 60% of the compound feed with poultry industry and consumes about 30% of all maize produced in the country (Okai 2010). The findings of the research confirmed this as farmers ranked maize as the highly used plant material. Maize is by far the major feed grain grown in Ghana and thus, provides more feed for livestock than the other species identified. Respondents were able to identify which browse, grass or supplement species and which part of the plant livestock fed on. According

to Komwihangilo et al. (1995), browses are of much importance in livestock feeding, especially in arid and semi-arid areas. They are also appropriate during long dry seasons with very low annual rainfall. The plant species served this purpose during the production seasons especially for ruminants and non-ruminant herbivores.



Figure 9. A farmer harvesting residue from a maize farm to feed his livestock.

Photo by: Author

It was revealed from the study that goat, sheep, pig, rabbit, grasscutter and snail farmers fed their livestock on grasses, forbs and browse species from nearby through the system of “cut and carry”; but cattle were the only livestock that were sent grazing on wild pastures, and this was due to the large volume of feed cattle consumes. Pasture lands in the study area provided animals with quality forage especially during the wet season when grass is in abundance (Knapp et al. 2002). The research also revealed that, plant parts such as leaves, stems, cobs, stalks, fruits, twigs, vines, crowns, peels and seeds were fed to animals. These, according to the respondents, are usually given to livestock (Atta-Krah 1989). Browse species are used mostly when grasses are low in quality and quantity and mostly during the dry season (Malechek & Provenza 1981). The study also revealed that forage species used as feed to feed livestock was more abundant in the rainy season as compared to the dry season. Seventeen respondent indicated the month of January as the severe period for feed

scarcity. This agrees with the findings of Otchere et al. (2002) that animals normally put on weight during the rainy season.

5.4. Feedstuff cost

Exchange rates is the key determinant of prices of feed material. Huge quantities of yellow maize are imported to boost the local supply. With the high interest on bank loans, local farmers find it difficult buying. Very intense lack of feed occurs in this intensive rearing systems due to the high rise in the prices of maize and other primary feed ingredients, also including other agro-industrial by-products, and thereby increases the expenditure of poultry and pig production (Oppong-Anane 2010). This situation is accompanied by an increased competition between humans and poultry for the primary feed ingredients (especially maize and soybeans), a contributory factor to feed scarcity and high cost.

Pig, fish and poultry farmers were the group of respondents who spent on buying of feed. The poultry, fish and a few pig farmers obtained their feed from the commercial feed millers. Pig farmers fed their animals, mainly on industrial waste (soya bean and sorghum malt) and supplemented it with cassava and plantain peels, pawpaw, moringa, mango fruits, pineapple and watermelon. The practice of feeding animals on industrial residue was found to be important, particularly among pig farmers. However, most of these wastes are not obtained for free; farmers buy them.

Feed cost is often a major limiting factor in poultry production compared to the other livestock species. According to Walker & Gordon (2003), feed alone accounts for over 70% of the variable costs production. This is not surprising because poultry production largely depends on concentrate feeds, which are expensive. Farmers said so because of the demand of feed during festive seasons. In comparison, pig farmers in particular have a wider choice in terms of industrial waste used as feed resources, which are relatively cheaper than the formulated feed.

5.5. Characteristics of livestock farmers

This study revealed that 14 of the respondents were between the ages 26 to 40 years; with an average age of 33 years showing that the youth are more involved in livestock rearing. This is therefore a good news because the involvement of the youth, who are more vibrant and energetic, can do it at their best. Also it can help reduce the problems of unemployment.

The study recorded a mean farming experience of 3.78, which implies that basically, most of the farmers are starters in the business. 26 of the respondents were males and four were females; this suggests that less female farmers were engaged in small scale livestock farming compared to their male counterparts. Perhaps the venture is a labour intensive activity and notwithstanding the numerous roles of women, more males are involved. This result is synonymous with findings of (Oppong-Anane 2010) who observed low number of females involved small scale farming. Again, it could also be due to limited decision-making powers, because of unequal power relations within the household and the community.

The average labour size was approximately 3, and this is slightly higher than the two persons as reported in the MoFA (2013), that most small scale farms operate with smaller workforce. It was also shown that ten respondents were the only individuals (labour) used in their farming activities. Household labour was the source of labour (family members) for respondents with between 2 to 6 labour sizes. Again, the family labour was utilized based on the availability of the individual; no full time workers are employed. The issue of labour size in this study confirms the findings of FAO (2011); that a small scale farming is a type of management system where the farm unit (a single farmer or a couple or a family or a cooperative) is at the same time the owner, the worker and the one who makes the decision.

16 of the respondents have been involved in the small scale farming for between 1 to 5 years. This could mean that they are starters and are in the farming activity for income generation. These livestock are mainly raised in the study area because they provide a

sources of income, as 24 respondents attested to this. The sale of livestock was the main source of income for the respondents.

Findings from the study revealed that two of the respondents had never been formally educated. However, nine respondents attained basic education (primary and Junior High School education), ten had attained secondary (Senior High School) education and nine respondents attained tertiary (college, polytechnic and university) education. This implies that, only two respondents were literates and could neither read nor write.

5.6. Measures taken to alleviate the feed and management constraints

The result showed that 14 of the respondents did not incorporate the cultivation of the grass, forb and browse species into their farming activities, and a reason that amounted to feed shortage during certain months of the year. The other respondents either sourced their feed from farm waste or waste from manufacturing industries. In ensuring availability and sustainability of forage species, five respondents recommended that avoiding the annual bushfires will be very helpful. Indiscriminate burning of bushes during the dry season is a problem to livestock farmers. Main reason which affected feed availability was season (Malechek & Provenza 1981).

Cattle, goat and sheep survival in Ghana, is mostly dependent on grazing on natural pastures, and there is an extreme seasonal variation in quantity and quality (MOFA 2011). Livestock farmers in the study supplemented their animal feeding with some feedstuff such as cassava peels and cassava leaves as well as cut forages particularly during the dry season.

Again, free ranging ruminants, especially cattle were limited to forage quality and quantity during the dry season (Hofmann 1989), this is because cattle's main source of feed was grazing on wild pasture in the study area. Local trees and shrubs for animal feeding were available. Others feedstuff were purchased from feed mills or Brewery Limited. Some farmers kept a few stands of trees (e.g. mango, moringa) in their homes to supplement feeding. This practice of growing trees also provided shade in hostile weather. Most farmers recorded the month of January as the period for serious shortage of feed. This was

attributed to the severe harmattan in the month of January. In the case of cattle, goat, sheep, grasscutter, rabbit, fish and snail keepers, the dry season led to the drying out of pastures, used for their feeding. In the case of pig, fish and poultry farmers, the shortage of feed was attributed to the high demand from feed mills and brewery, because famers wanted to meet the demand from their customers during the Christmas celebrations (Oppong-Anane 2010).

The major constraints in animal husbandry as mentioned by the respondents were animal health, availability of feed during the dry season and bushfires. Also, bush fires and a fall in nutritional gains of fodder also made it demanding for livestock to meet their nutritional need in the dry season. Many animal raisers resorted to farm residue during the dry season as reported by Annor et al. (2007). He also identified this case to be associated with body weight gain in the rainy season and weight loss in the dry season. These outlined challenges have made feed for livestock the main shortfall which needs to be dealt with in order to boost productivity in the area. Farmers mentioned disease as the second major constraint to feed and nutritional need in dry season. Thus, the present study has demonstrated that there is the need to intensify animal disease control strategies in the study area.

In most cases, farmers provided feed in ad libitum quantities to their animals (as evidenced by amounts of feed in most feeding troughs and pond). As noted earlier, farmers fed crop residue as cassava peels, plantain peels, as well as industrial waste such as sorghum malt. Apart from this, during the dry season producers who relied solely on natural pastures found it difficult to provide adequate feed for their animals. However, they indicated that they could obtain cassava peels from the local restaurants when necessary. Its therefore appears that if emphasis is placed on simple practices like processing (cutting and drying) and storing of the most available feedstuffs (peels of cassava, plantain, etc.), as well as supplementation to provide feed, the feeding problem could be alleviated. The impact of attending to the feed problem is often evidenced seasonally as reported by Devendra (2007). Again the study showed that plant feed source were abundant in the wet than the dry season.

6. Conclusion

Small scale livestock farming in the Ga East district of the Greater Accra region would continue to play essential roles in Ghana, with more males been involved in this practice. One motivation especially for cattle, sheep and goat, grasscutter and rabbit livestock keepers is the availability of feed in wild pastures. Farmers raised animals for income generation.

Main identified constraints by the livestock keepers were health problems, feed availability during the dry season and bush fires. Notwithstanding these factors, keepers are convinced that activity will still go on because the young between the ages of 26 to 40 are more involved in livestock farming; as some farmers above 40 years are aging. For small scale production to become attractive to farmers, solutions must be found to the constraints. Farm education by agricultural extension workers, will help give farmers information on how to solve these challenges.

In conclusion;

- It was observed that farmers used different plant species and parts of the plants available in the area to feed different species of livestock.
- The source of feed were from wild pasture, crop residue, formulated feed from feed mills and waste from manufacturing industries. From the study pig, fish and poultry farmers were the only respondents who spent money in getting feed for their livestock. Feed scarcity is a major challenge to livestock farmers.
- It is therefore recommended that farmers should adopt forage cultivation into their annual farming systems to supplement the feeding of their animals. Again, farmers should keep proper records, to enable them access the profitability of the venture.

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Appendices

List of the Appendices:

Appendix 1: Survey questionnaire for Small scale livestock farmers

Appendix 2: Pictures from the research with description

Appendix 1: Survey questionnaire for Small scale livestock farmers

Questionnaire to Study Livestock inventory of small-scale farms in Ghana with the special focus on feedstuffs. Information gathered will solely be used for the purpose of this study. I personally assure you that your answers will always be kept strictly confidential and never be revealed to any other people. The only thing I am requesting from you is that you answer the questions frankly, in your best possible way, and to the best of your knowledge. If you cannot answer some questions, simply say so.

Do you agree to participate in this survey? 1. Yes 2. No (If Yes, continue the survey)

Instruction: Encircle with correspondence, list accordingly and provide information where necessary.

Date:

Region:

District:

Community:

1. General information

1.1 Gender

- a. Male b. Female

1.2 Age

- a. 18 – 25 b. 26 – 40 c. 41 – 59 d. > 60

1.3 Farming years' experience

- a. 1-5 b. 6-10 c. 11-20 d. 21-30 e. > 30

1.4 Level of education

- a. None b. Basic c. Secondary d. Tertiary

1.5 Main purpose of production (choose one)

- a. Income generation.
- b. Food products to feed family.
- c. Off farm (e.g. transport, recreation, sport, research, religion).
- d. On-farm functions manure production traction.

2. Livestock raised on farm

2.1 (tick as many as corresponds to your farm)

Livestock	Tick	Breed	Number
Goat			
Sheep			
Cattle			
Pig			
Poultry			
Rabbits			
Grasscutter			
Fish			
Snail			

2.2 Size of farm area in acres ...

- a. < 5 acres
- b. between 6-10 acres
- c. between 11-15 acres
- d. between 16-20 acres
- e. between 21-30 acres

2.3 Labour size

- a. 1
- b. 2
- c. 3
- d. 4
- e. more than 5

3. What do you feed animal with? (Choose one, the most important)

- a. Formulated feed
- b. Local plant source
- c. Industrial waste
- d. Kitchen waste
- e. Garden/crop waste

5.1 What is the main consequence of the feed shortage on your livestock? (Choose one)

- a. Weight loss
- b. Yield reduction
- c. Weakness
- d. Increased mortality
- e. Abortion frequency

5.2 What are your main constraints in livestock raising?

6. Main measures taken to alleviate the issues of feed shortages? (Choose one)

- a. Feed preservation as hay
- b. Use of improved forage production
- c. Purchase concentrates
- d. Forage purchase (rent grazing land)
- e. No measures taken

7. Do you keep farm records? YES or NO.

If No, why?

- a. Do not know how to keep records
- b. Have no need for records
- c. Have no time for record keeping

8. Feed supply and cost

8.1 Is your feed purchased from? (choose one)

- a. Local market
- b. Farm residue
- c. Manufacturing industries

8.2 At what cost is feed purchased per kilogram? Please state.....

9. What is your estimated yearly income?

NOTE: Thank you very much for your participation in this survey. Your answers will be extremely useful for our research. Again, I assure you that all the answers you have provided in this survey will be kept strictly confidential and will never be revealed to any other person outside our research group. Would you mind telling me your name please?

Appendix 2: Pictures from the research with description



Photo 1: A visit to a pig farmer in Abokobi community, Ga-East district.



Photo 2: Sheep feeding on plantain leaves



Photo 3: Grasscutter feeding on elephant grass