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Livestock inventory of small-scale farms in Greater Accra Region in Ghana

MASTER'S THESIS

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Declaration

I hereby declare that I have done this thesis entitled “Livestock inventory of small-scale farms in Greater Accra Region in Ghana” independently, all texts in this thesis are original, and all the sources have been quoted and acknowledged by means of complete references and according to Citation rules of the FTA.

In Prague 26th April 2019

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Abstract

This Master´s thesis focused on small-scale livestock farmers in Ga East district in Greater Accra Region in Ghana. Main aim was to determine livestock and mini-livestock species and breeds diversity as well as to evaluate the structure and management practises on the farms. Ten communities were selected from this area for the research using snowball sampling technique. Semi-structured questionnaires were administered to 30 farmers. Descriptive statistics (means and percentages) was used to summarize the data obtained. The results indicate that small-scale livestock farmers in Ga East are predominantly men (93, 3 %) with various levels of education. Animals reared on farms were poultry, pigs, cattle, sheep, goats, greater cane rats, rabbits, fish and snails. In total 13 livestock species and 27 breeds. About 85 % of interviewed pig farmers bred imported breeds such as Large White and Landrace, indicating decreasing population of local Ashanti Black bread. High prices of feeds and its unavailability throughout the year with poor husbandry practises were identified to lead to general low productivity and efficiency of livestock farmers. A holistic approach to management practises like for example own production of animal feedstuff on the farms and improvement of overall functioning of farmer as a businessman is needed in order to increase general low productivity of this sector.

Key words: West Africa, management practises, indigenous species, productivity, mini-livestock, snails

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List of the abbreviations used in my thesis

FAO: Food and Agriculture Organization

GSS: Ghana Statistical Service

MOFA: Ghana's Ministry of Food and Agriculture

TLV: Tilapia Lake Virus

BSF: Black soldier fly

FFS: Farmer field school

1. Introduction and literature review

Labour and land productivity in Africa are among the lowest in the world. Over half of the African population is rural and directly dependent on locally grown crops and livestock (Bationo et al. 2007). Agriculture accounts for about 65% of the region´s employment and 75% of its domestic trade. Significant progress in reducing hunger and poverty across the region depends therefore on the development and transformation of the agricultural sector. Transforming agriculture from largely a subsistence enterprise to a profitable commercial venture is the prerequisite and driving force for accelerated development and sustainable economic growth in sub-Saharan Africa with Ghana being no exception (Chapoto et al. 2018).

The Ghanaian economy is based largely on agriculture which accounts for 35% of the GDP. Agriculture in Ghana is dominated by small scale producers with average farm size of about 1.2 hectares and low use of improved technology (Cervantes-Godoy & Dewbre 2010). The small-scale farmers account for about 80% of domestic production (MoFA 2011). The country's agriculture is also characterized by low crop and animal productivity. Farmers focus predominantly on cereal and legume production and livestock rearing. Livestock rearing is an important component of crop-livestock farming system, because it serves as an insurance against crop failure, source of manure, source of cash and makes good use of crop residues. Other feed resources used in the area include agro-industrial by-products like corn mill waste flour, brewers' spent grain, maize bran, and rice bran, cassava and yam peels (Umutoni et al. 2015). Domestic production is however not able to cover country´s demand for foodstuff. Every year, Ghana imports food items worth about 1 billion dollars (König et al. 2016). There are however many reasons behind this fact. The major one is low productivity of the agricultural sector in general. Insufficient management practices in livestock rearing such as poor housing, feeding, diseases control and breeding system do not allow local farmers to produce enough foodstuff, which could be provided to the local markets. Some of the authors state, that this issue could be solved by bringing new, more productive exotic breeds of animals, but there is no point in having livestock with a high

genetic potential, if the rearing conditions are such, that this potential cannot be tapped. An increased proportion of exotic breeds or crossbred groups in livestock populations might offer opportunities, but on the other hand could also pose a risk to the livelihoods of poor livestock keepers through the loss of valuable traits of their animals, such as disease resistance, adaptation to the local conditions or hardiness (König et al. 2016).

In sub-Saharan Africa, livestock production is severely limited in tsetse- infested areas where trypanosomosis occur (Osaer et al. 1994). The usual consequence of trypanosome infection is anaemia, which is accompanied by poor growth, weight loss, low milk yield, infertility, abortion and paralysis (Ganyo et al. 2018). Death may result within a few weeks to several months after infection. The use of prophylactic and curative drugs especially during wet season has remained the most functioning method for the management of animal trypanosomosis in sub-Saharan Africa (Dagnachew et al. 2015). The disease results in loss of livestock and agricultural productivity with serious socio-economic consequences (Adam et al. 2012). The infected area covers about 7 million square kilometres of land, which is perfectly suitable for grazing or browsing and therefore for livestock production. Based on these facts it is estimated, that possible extinction of trypanosomosis would provide equatorial Africa with an additional 15 kg meat and 40 kg milk per person per year (Pirchner 2001).

In West Africa, another serious constraint to agricultural development is also limited access to agricultural information (Munyua & Stilwell 2013). This is strongly linked to financing. Farmers often do not know about funding possibilities or cannot afford expensive bank loans, which they might use for expansion of their ventures or as an investment in farm equipment (Antholt 1994).

1.1. Agriculture in Ghana

Agriculture in Ghana is dominated by small-scale farmers with average farm size of about 1.2 hectares (FAO 2013). Small-scale or smallholder farmers are farmers, who cultivate land smaller than 2 hectares (Chapoto et al. 2018).

Small-scale farming is comprised of a diverse range of relatively small-sized socio-economic structures that use limited landholdings to pursue diverse agricultural, pastoral and natural resource management activities on family or household owned fields. Livestock rearing of family owned animals and natural resource management activities are mostly undertaken jointly on commonly accessible lands (Chapoto et. al 2018). Unlike other categories of farmers, they are largely managed by family members and depend mainly on the labour of theirs or their families. Although most smallholder farmers are largely devoted to produce food for their own consumption, they bring also limited but significant amount of resources to the local markets (Sam 2016).

They are often located in remote areas with poor infrastructure, inadequate access to information and imperfect markets with no government support services such as bank loans or training (Sinyolo & Mudhara 2018). They face several constraints that limit the effectiveness of their farming activities and therefore not allowing them to fight properly with rural poverty and food insecurity challenges. Smallholder farmers in developing countries are also characterised by low uptake of improved farm inputs and weak links to markets (Sinyolo & Mudhara 2018). Even though they represent 50 percent of the country´s population, in 2012 the small-scale farmers cultivated only 14 percent of the total farmland in Ghana (Table 1).

Livestock production is of major socio-economic importance in Ghana, contributing significantly to people's livelihoods while playing a key role in food security and rural development, often with a critical socio-cultural dimension (FAO 2013). Therefore, there is a need for mechanisms to address the challenges that smallholders face to enhance their market participation as well as to increase their use of modern technology assets (Chapoto et. al 2018). This paper has been focused just on small-scale livestock farmers.

Table 1 Changes in farm structure in Ghana, 1998–2012 (Chapoto et. al 2018)

Farm size categories	Number of farming households		% in total farm households		% of total cultivated area	
	1998	2012	1998	2012	1998	2012
0-2 ha	1,557,856	1,508,509	55.6	49.3	16.8	14.0
2-5 ha	863,656	1,070,565	30.8	35.0	31.9	33.3
5-10 ha	257,032	328,354	9.2	10.7	21.8	23.2
10-20 ha	93,272	114,504	3.3	3.7	15.3	15.3
20-100 ha	27,768	33,667	1.0	1.1	10.2	10.7
>100 ha	1,424	1,740	0.1	0.1	4.1	3.5
Total	2,801,008	3,057,338	100	100	100	100

1.2. Cattle of Ghana

The cattle of Ghana are comprised mainly of small, long horned, humpless breed N'Dama with its strains and crossbreeds and West African Shorthorn with its strains and crossbreeds (Vohradský 1999). Breeding of cattle in this area of Africa is very problematic, for this area is largely inhabited by tse-tse fly, which transmits trypanosomosis (Odeniran & Ademola 2018). Animals of local breeds possess natural tolerance against this disease and are therefore a basis for any kind of cattle production in West Africa.

1.2.1. N'Dama

The N'Dama breed is the most representative "*Bos taurus*" breed of cattle in West Africa. There are many other local names such as N'Dama Petite (Senegal), Mandingo (Liberia), Boenca or Boyenca (Guinea-Bissau), Malinke, Futa, Fouta Malinke (Ivory Coast), Fouta Longhorn, Fouta Jallon, but all of them refer to the same animal (Vohradský 1999). We recognize also three specific strains of this breed such as Boenca, N'Gabou and Gambian N'Dama and three stabilized crossbreeds – Jakoré, Bambara and N'Dama Sanga (Mason 2002).

The origin of this breed is located to the Fouta-Djallon highlands of Guinea, where about 8,000 years ago these animals have been domesticated for first time. From there the N'Dama has spread in the Sudanian and Guinean regions. This breed is a hardy, medium size type animal with 100 cm at shoulder height for cows and 120 cm for bulls. They have a large and strong head with lyre-like shaped horns (Traoré et al. 2018). The average adult weights range from 320 to 360 kg and 250 to 270 kg for males and females, respectively (De Boer 1990).

N'Dama cattle are dual purpose animals, which means they are used for both milk and meat production. Even though the cows are not very good milk producers, they can produce 2 to 3 litres of milk per day for a lactation period of 7 to 8 months (Osei & Effah-Baah 1989). In these circumstances the yield for humans can be up to 70-100 kg per cow per year. The full lactation yield is estimated to be about 500-600 kg (Vohradský

1999). This breed is also suitable for meat production due to its very good flavour without much fat. The dressing percentage is around 50% (Rege & Tawah 1999).

However, the most important quality of N'Dama is its natural resistance to trypanosomosis, parasitic helminths as well as to various tick-borne diseases (Ganyo et al. 2018). (Mason 1988) also emphasizes its general ability to survive and be productive in stressful humid and dry tropical climates of West and Central Africa (Jabbar et al. 1998). For these reasons, N'Dama must be perceived as a breed of choice, which can help to improve livestock production in West and Central Africa and thus meet the increasing demand for meat and milk products in this area (Traoré et al. 2017). According to the FAO, there are approximately 7 million head of N'Dama cattle nowadays in West Africa (Traoré et al. 2018).

1.2.2. West African shorthorn

The West African shorthorns can be divided into two subgroups according to their size and body shape. These two parameters are influenced by the habitat the animals occur. The larger Savanna type is mainly found in the Guinean or Sudano-Guinean savannahs from Ivory Coast to Cameroon, while the smaller Dwarf type inhabits predominantly forest and coastal regions of West Africa (Mason 2002). Since this paper is aimed at cattle in Ghana, the Ghanaian form of West African shorthorn is the most important for us.

The Ghana Shorthorn is a small-sized animal, with good beef conformation (Rege et al. 1994). Its head and neck are both long, but the neck is thin and the forehead flat. The breed originates from a variety of West African Savannah Shorthorn with some admixture of zebu cattle. The hump is absent, and the dewlap is poorly developed, typical of *Bos taurus* cattle. Ghana Shorthorns vary considerably in colour markings: black-and-white animals are common, in addition to other colour patterns such as solid black, white and mottled black-and-white (Maule 1990).

The Ghana Shorthorn is considered to be tolerant to trypanosomosis and tick-borne diseases and adapted to the harsh hot and humid tropical climate similar to

N'Dama (Jabbar et al. 1998). The breed is used for meat, milk and in remote areas also for draught purposes. Despite the fact it gives the lowest milk yield among all other indigenous breeds of cattle in Ghana (Osei & Effah-Baah 1989), the Ghana Shorthorn responds well to higher levels of nutrition. Therefore, there is a great potential for production improvement of this breed when properly fed (Rege et al. 1994).

1.2.3. White Fulani

The White Fulani, in Ghana sometimes also called Yakanaji or Akouare, are the most numerous zebu type breed of cattle in Ghana (Rege & Tawah 1999). They are characterised by long lyre shaped horns (see Figure 1), moderate hump in the females and a well-developed hump in the males. They are predominantly white with black ears, eyes, muzzle, hooves, horn tips and tip of the tail (Tawah & Rege 1996). Fulani and Hausa people, who are their predominant owners use them mainly for milk production, but this breed has an excellent potential as a dual-purpose dairy/beef breed (Rege & Tawah 1999). White Fulani is more heat tolerant than the N'Dama, they have genetic basis for the resistance to intestinal helminths, as well as to dermatophilosis, but they are less tolerant to trypanosomosis (Tawah & Rege 1996).

Figure 1 Herd of White Fulani cattle in Abokobi (photo by author)

1.3. Sheep of Ghana

Currently the sub-Saharan African domestic sheep genetic resources are classified as indigenous populations maintained under traditional farming systems (Kosgey et al. 2008). They are divided into two main groups with a largely non-overlapping distribution: thin-tailed and fat-tailed sheep (Wilson 1991).

The thin-tailed sheep are found mainly in North Africa from Morocco to Egypt, in Sudan and in West Africa from Senegal to Nigeria (Mason 2002). There are two main sub-types, the African long-legged, found mainly in the arid and semi-arid zones of the Sahel and Western Africa and the tropical dwarf sheep (Djallonké sheep) found mainly in the sub-humid and humid zones of West and Central Africa.

The fat-tailed sheep are the most widely distributed sheep on the continent today. They are found in northern Africa from Egypt to Algeria, and in the eastern and the southern regions of the continent from Eritrea to South Africa. These sheep are further divided into two sub-types, the fat-tailed hair and fat-tailed wool sheep variety, depending on types of coat. Since this paper is focusing on sheep of Ghana, we will talk mainly about Djallonké breed, which is the most abundant in Ghana (Koney 2004).

In general, small ruminants like sheep and goats constitute an important sub-division of the animal production industry in Ghana, representing 17% of the traditional livestock population in Ghana and contributing 49% of all ruminant meat in the country (FAO 2013). Sheep along with goats are a typical feature of smallholder farms in Ghana. Sheep might be well integrated into the crop-livestock farming system where crops and livestock complement each other and therefore reduce the risk farmers could face by focusing predominantly on crop or animal rearing. The majority of the sheep in this area are of the West African Dwarf breed (Vohradský 1999).

1.3.1. West African Dwarf sheep

West African Dwarf is the predominant breed of sheep in West Africa as well as in Ghana. Its distribution starts in the west in Senegal and goes through most of the countries of the Gulf of Guinea up to Cameroon and the Republic of the Congo (Mason

2002). There are several synonym names used for this breed such as Djallonké, Fouta Jallon, Kirdimi, Lakka, Forest type sheep and others (Vohradský 1999).

Djallonké are thin-tailed sheep known for their adaptation to the tropical hot and humid climate, we can find in West Africa, and are considered trypanotolerant. The front half is usually black or brown (see Figure 2) with the back half being white. They reach a height of 40 to 60 cm at the withers and weigh 20 to 30 kg or 25 to 35 kg for females and males respectively (Traoré et al. 2008). The rams are horned with ewes being polled. The horns are wide at the base, curve backwards, outwards and then forwards again, with a maximum of one and a half coils (Vohradský 1999).

The Djallonké sheep are used mainly for meat production. They have good reproductive capacity - age at first lambing is around 19 months and lambing interval is approximately 10 months. Average litter size is 1.22, ranging from 1.0-1.7 depending on variety; for example, it is 1.12 lambs for the variety in Senegal, and 1.7 for that in Ghana (Salifu 2014). Ewes of this breed have an average productive life of 5.8 years (Kosgey & Okeyo 2007). However, although Djallonké is the main source of mutton in the country, the potential of this breed as a source of meat is limited by its small mature size (21-26 kg) (Koney 2004). If this breed is supposed to play some important role in meeting the meat requirements of Ghana, which is in the presence being solved by high imports of meat, it would be advantageous to increase its size without significant negative effect on its prolificacy. Crossbreeding Djallonké with a larger sheep breeds, like for example with Sahelian sheep might have a promising result, because this could take advantage of the larger mature body size (35-65 kg) and faster growth rate of the Sahelian breed (Kabuga & Akowuah 1991). Although the crossbreeding between these two breeds is being already carried out, such crossbreds account for only 10% of the total population of sheep in Ghana (Koney 2004).

Figure 2 Djallonké sheep feeding on banana leaves (photo by author

This along with the rapid reproductive turnover traits like early puberty, short gestation and quite high incidence of multiple births might enable a farmer to quickly build up a flock of sheep as a major capital asset (Ngere & Aboagye 1981; O. Ngere & Aboagye 1981)). With increased production, the farmer has a surplus for sale, and with the cash income he can afford additional household needs, school fees, medical bills or other emergencies.

In Ghana the population number for the Djallonké sheep is estimated to be around 1.8 million animals (Yaro 2017).

1.3.2. Nungua Blackhead

Nungua is a crossbreed between local Ghanaian type of West African Dwarf sheep and the Persian Blackhead sheep from Somalia. The reason for crossbreeding of these two breeds was to create animals with improved meat production (Fianu et al. 1996). Even though the crossbred has lost some of the Djallonké high prolificacy ability determined by high rates of triplets (0.041) and twins (0.557) the characteristics related to meat production have been significantly increased (Ngere & Aboagye 1981). As we

can see in Table 1, Nungua Blackhead lambs have higher postpartum weight, they are heavier at weaning and have better daily intake in comparison to Djallonké breed (Ngere 1973).

Because of these facts, Nungua Blackhead lambs grow faster and achieve the adult weight of local breed much earlier.

Table 2 Body weights at birth and weaning for Forest and Nungua Blackhead sheep (Ngere 1973)

	Forest Type	Nungua Blackhead
Weight at birth (kg)	1.3 ± 0.23	2.3 ± 0.45
Weight at weaning (12 weeks) (kg)	5.8 ± 0.7	9.8 ± 1.9
Average daily gain up to weaning (g)	50 ± 9	90 ± 20

1.4. Goats of Ghana

Most of the goats in Ghana are of the West African Dwarf breed, also sometimes called the Forest goat (Mason 1988). This breed is traceable to the so-called pigmy goat, which is one of the ten primary goat breeds believed to have originated from the wild Bezoar goat - *Capra aegagrus* from Asia Minor. This breed is widespread throughout the whole Central and West Africa and names such as Cameroonian, Ghanaian, Nigerian, Guinean and Fouta Djallon refer to the particular geographical varieties or ecotypes of West African Dwarf goat, which have adapted to the different environments in the different countries of West and Central Africa (Chiejina et al. 2015).

The name refers to the stuntedness, exhibited by very short legs, which is most likely an adaption to the humid and hot conditions of West and Central Africa (Karikari & Blasu 2009). West African Dwarf goats are extremely important in rural village economy of West Africa with no exception for Ghana, but their productivity is poor (Birteeb et al. 2015). The low productivity of this breed as well as of most of the other local breeds of livestock in Ghana is predominantly due to the slow growth rate resulting from poor genetic and management factors.

1.4.1. Ghanaian West African Dwarf goat

West African Dwarf goat is a small goat with long neck and short legs. At the withers they reach height of 30 to 50 cm and weigh between 20 to 25 Kg (Vohradský 1999). Both sexes have short horns with hair colours varying from dark brown, which is

Figure 3 Colour varieties in Ghanaian West African Dwarf goat (photo by author)

the most common, to black, white, dark red and their combinations. (Chiejina et al. 2015) highlights its high trypanotolerance as well as tolerance against various helminths with *Haemonchus contortus* being the most problematic helminth affecting ruminants in this area. WAD goats are prolific and fertile with 2.4 kids per dow per year (Birteeb et.

al 2015). These attributes are unfortunately not utilised properly because of insufficient management practises and mainly proper feeding. Therefore, the revenues from such a venture remain low (Abdul-Rahman 2017).

1.5. Pigs of Ghana

Swine production in Ghana is carried out in many various types of systems or facilities. These range from rural pasture systems where pigs have little or no shelter and roam freely throughout a land in search for food and water, to more intensive systems where pigs are totally enclosed and relying with their needs entirely on the keeper (Banson et al. 2014). Pigs are heat sensitive and can die from heat stress. Even though deaths due to overheating are not that common, growth performance can be negatively affected by heat stress and therefore the whole economy of the production.

Apart from constraints connected to the climatic conditions and others such as increasing prices of feed or insufficient veterinary services, pig production is becoming attractive for more and more small-scale farmers in Ghana (Osei-Amponsah et al. 2017). Especially because of the short gestation period of sows, which farrow several piglets at a go, possibility to meaningfully utilize wastes from households, good conversion rates and increasing interest for pork meat and pork products among local population. These are the main reasons why pig numbers in Ghana in recent years have almost tripled (FAO 2013). Mason (1988) distinguishes three strains of local pigs occurring naturally in West Africa such as Black Ashanti from Ghana, Bakosi from Cameroon and Nigerian local pig from Nigeria.

1.5.1. Black Ashanti pig

Black Ashanti pig is the commonest local breed raised at the subsistence level in mixed farming systems in Ghana (Osei-Amponsah et. al 2017). It is rather small in size reaching mature weight around 60 kg (Vohradský 1999). Ashanti pigs have typical long head with prolonged snout and erect ears. Colour of the skin as well as of the bristle is black. They are hardy, more resistant to heat stress, able to digest diets rich in fibrous matter and tannins and have very good mothering ability (Abdul-Rahman et al. 2016). In comparison to commercial exotic breeds such as Large White and Landrace they are also less susceptible to most of the local diseases and parasites.

Figure 4 Seven months old Black Ashanti pigs (photo by author)

On the other hand, Black Ashanti pigs grow slow, they have poor reproductive performance with 5-7 piglets on the average per litter and therefore smaller economic potential compare to exotic breeds (Banson et al. 2014). That is why number of farmers in last years prefer to breed imported breeds like Large White or Landrace even though they cannot properly utilize their genetic potential due to improper management practises at the farm (Addah et al. 2016). Because of this we can witness decreasing numbers of Ashanti pigs being bred by pig farmers in Ghana, which could subsequently

lead to loss of important genetic characteristics of this breed we might need in the future to cope with new environmental challenges (Osei-Amponsah et. al 2017).

1.6. Poultry of Ghana

Poultry farming in Ghana as well as in other developing and developed countries is a crucial sector of animal husbandry. There are two main systems under which the poultry is being kept. The extensive system, practiced by about 66% of the 3.7% million households in Ghana, rely predominantly on local native breeds of chickens like cocro. These are kept for meat and eggs and sold for emergency cash needs and also used for socio-cultural purposes (FAO 2013). Regardless of low output from native chicken in the tropics they can thrive and produce with irregular supply of feed and water and with minimum health care (Osei-Amponsah et al. 2011). Even though, local chickens are slow growers and poor layers of small sized eggs, they are however ideal mothers, good sitters and excellent foragers. They are hardy and possess natural immunity against common indigenous diseases (Padhi 2016).

Local chickens generally scavenge around the homestead areas during the day, where they feed on kitchen wastes, leftover cereals like rice, wheat, pulses, green grass, insects and other edible stuff they find. These waste feedstuffs are utilised by native

Figure 5 Local chicken farmer with cocro breed (photo by author)

birds to produce a good quality, cheap source of animal protein. It is estimated that here are about 25 million free-roaming village poultry in Ghana contributing significantly to the national animal protein supply (MoFA 2013).

Intensive poultry production sector that depends on exotic breeds of chickens, ducks and quinea-fowls has occurred in Ghana first in the early 1960´s when Ghanaian government identified poultry production with its huge potential as the best tool how to increase inadequate supply of animal protein in the country and how to create job opportunities for mainly rural population (Anang et al. 2013).

The growth of the industry was at the beginning very slow mainly due to irregular supply of day-old chicks, which had to be imported and other inputs such as vaccines, drugs and feed additives (MoFA 2011).

This had negative impact on controlling diseases like Avian influenza or Newcastle disease, which had caused additional damages to the whole industry, for farmers did not have any way how to sufficiently protect their flocks. In 1970´s the situation got better, partially because of removing the custom duties on poultry inputs, which made drugs and vaccination more available for farmers and they could then better fight with various diseases (FAO 2012).

However, in 1980´s the economic situation in Ghana got worse resulting in higher prices of feed ingredients and other inputs and poultry production declined. Ghanaian government reacted with liberalization of trade and re-implementation of taxes and duties on imported inputs. This has opened Ghana´s poultry market for other countries like Brazil, USA or European countries, which since then are flooding Ghana with cheap frozen poultry meat. The problem is, that local population prefers imported meat, mainly because of the price. Domestic poultry products are about 30-40% more expensive and in addition they are not processed into cut parts of leg quarters and wings which is also preferred by local consumers (SRID 2014).

Poultry is being raised for the purpose of meat production (broilers) and/or eggs production (layers).

1.6.1. Broiler production

In Ghana, poultry meat consumption is dominated by chicken meat, but other poultry species such as guinea fowls, turkeys, ducks and ostriches are being consumed. The most common broiler types used on small-scale farms are Cobb (USA) and Hypeco (Holland).

In Ghanaian conditions broiler production is however not that much profitable. Feed costs represent over 60-70% of overall production costs (SRID 2014). Besides high prices of the feedstuffs there are problems also with their availability throughout the year. During dry period sufficient supply of yellow corn and fish meal is often lacking. Farmers involved in broiler production therefore aim to make their chickens ready mainly for festive occasions like Christmas, Easter or Ramadan when demand exceeds supply and when they can earn a decent revenue (Anang et. al 2013). Most of the farmers therefore focus rather on raising layers, which is more profitable.

1.6.2. Layer production

Layer production in Ghana is considered to be more profitable in comparison to broiler production (Anang et. al 2013). Apart from no competition in marketing of eggs with foreign countries like USA, Brazil or EU countries, eggs do not have to be processed in any way. Farmers can therefore take advantage of selling to retail sellers with no additional costs needed to invest in selling their eggs, which is usually being done at the gate of their farms. Among the breeds of layers which are used for egg production in Ghana, Lohmann Brown and White Leghorn account for the biggest part (MOFA 2011). Both breeds are highly specialized on egg production. They are light reaching body weight around 1.5 – 1.6 kg. They start laying eggs at around 18 weeks of age and the production cycle last approximately for 18 months. Depending on the husbandry practises they can lay up to 200 eggs per year (Anang et. al 2013).

1.7. Guinea Fowl

Guinea fowl (*Numida meleagris*) is one of the major poultry species consumed in West Africa (Baruwa & Sofoluwe 2016). In Ghana this species is considered to be a delicacy. Commercial production of exotic guinea fowl started in 2001, but due to lacking infrastructure, fertile eggs of guinea fowls must be imported from Belgium, which increases the running costs (SRID 2014).

1.8. Fish farming

Fish production in Ghana consists mainly of marine and inland fisheries. Only about 7% of fish meat comes from aquaculture. Aquaculture in Ghana is dominated by breeding of tilapias and catfish (Kassam 2014). From catfish, species *Clarias gariepinus* and *Heterobranchus bidorsalis* are being bred the most, while in tilapias it is the local Akosombo strain, which has been developed by the Aquaculture Research and Development Centre. No other tilapia strains are currently allowed to be cultivated in Ghana. This is a preventive measure to prevent spread of exotic diseases like for example TLV (Rurangwa et al. 2015).

Tilapias are predominantly bred in cages. The cage prevents unwanted reproduction, because it allows the eggs to pass through the cage netting before they can be fertilized. Uncontrolled reproduction causes producing large numbers of fry and therefore small, stunted populations. Farmers then struggle with marketing such small fish on the markets. Another big advantage of cage farming is also easy harvesting.

For catfish production are usually used earthen or concrete ponds (Figure 6) The biggest problem in catfish farming is however insufficient supply of quality fingerlings, which is usually the stadium the fish farmers start with (Kassam 2014). Lack of existing hatcheries for catfish in Ghana, little knowledge of new modern rearing systems, high cost of feeds as well as improper equipment and bad infrastructure make it very difficult for small-scale farmers to increase their production and contribute more to national food security (Nyina-Wamwiza et al. 2012).

Figure 6 Concrete pond for catfish farming (photo by author)

1.9. Rabbit farming

Rabbit farming in Ghana as well as in whole Africa represents currently a very marginal area of farming. Even though rabbits are known for their superior ability to multiply fast, farmers usually struggle with proper management practises such as feeding and control of diseases (Odeyinka et al. 2008). Where the market offers an interesting niche, which is for example in touristic areas, farmers keep breeds such as Flemish giant, Chinchila or California.

1.10. Greater cane rat farming

Grasscutters or greater cane rats *(Thryonomys swinderianus)* are big rodents originating from Sub-Saharan Africa. Adult individuals measure about 60 cm and can weigh up to 6 kg (Jori et al. 1995). They have elongated head, small ears, long tail and their fur colour ranges from brown to greyish with some exceptions like for example

Figure 7 Rare albinotic form of a female grasscutter (photo by author)

albinotic variety, which can be seen in Figure 7. Grasscutters have been hunted for centuries in wild, for they meat especially in West Africa is considered to be a delicacy. Annor and Kusi (2008) state, that there is consumed about 40 000 tonnes of grasscutter meat every year in West Africa. This however led to mass overhunting and severe decline in grasscutter's populations in several areas (Ansah et al. 2012). Therefore, commercial farming of these animals has been promoted in many African countries (Adu et al. 1999) (Adu et al. 1999). Grasscutters are herbivorous, consuming all kinds of local grasses such as guinea grass *(Panicum maximum)*, sugar cane *(Saccharum spp)*, elephant grass *(Pennisetum purpureum)* or giant star grass *(Andropogon gayanus)* as well as

grains, tubers and other agro-industrial by products or kitchen leftovers (Ansah et al. 2012). They can breed throughout the year with approximately two litters of 4 youngs on average per litter (Annor and Kusi 2008)

Rearing grasscutters in captivity can help to re-establish damaged populations in wild, increase food security situation by producing high desired animal protein, which is in addition accepted by all cultural and religious groups as well as improve socio - economic status of farmers and their families (MoFA 2013).

1.11. Snail breeding

West Africa is home to one of the biggest species of snails in the world. Depending on the particular species they can measure up to 30 centimeters (see figure 8) and weigh up to 700 g (Ogunniyi 2009). Achatinas, commonly called in Ghana “Congo meat” have been therefore traditionally hunted and collected by local people in West and also Central Africa for centuries (Agbogidi & Okonta 2011). Snail meat is an extraordinary source of proteins, rich in elements such as iron, phosphorous or potassium and low in fats (Blay et al. 2004). However unsustainable harvesting followed by habitat destruction and overuse of agrochemicals lead to a serious decline in snail populations in many areas (Cobbinah et al. 2008). Local governments reacted to this situation by promoting people to start with snail farming.

Snail farming is considered to be low cost, for breeding stock needed for beginning of the potential business can be simply gathered from adjacent environment, fed by leaves, fruits or kitchen waste and can be kept in useless materials like for example old car tyres (Ngenwi et al. 2010). However, despite the big potential of snail farming, which can serve either as an income generating activity or way how to improve farmers diet, people dealing with snails focus predominantly just on keeping of snails than on their breeding. Average time needed by snail hatchling to get marketable size is about 1-2 years (Ogunniyi 2009), which is for most of the local farmers too long. They prefer to bring larger quantities of snails from areas where snails still occur to cities,

where they just keep them in temporary constructions, until they sell them at the market.

Figure 8 Snails at Madina market (photo by author)

2. Aims of the Thesis

Main objective of my thesis was to determine livestock and mini-livestock species and breeds diversity on smale-scale farms in Greater Accra Region on Ghana. Further aim was to evaluate the structure and management of those farms to be able to determine socioeconomic status of the farms and its impact on livelihoods of farmers and their families.

The specific objectives were to;

i. Determine the characteristics of small-scale farmers.

ii. Determine the main problems farmers must deal with.

iii. Determine ways how to improve socio-economic status of the farms.

3. Methodology

3.1. Study site description

This study was conducted in Ghana in Greater Accra Region. Ghana is one of the most developed countries in West Africa with one of the most thriving democracies on the continent. It has often been referred to as an "island of peace" in one of the most chaotic regions on earth. The country's economy is dominated by agriculture, which employs about 40 percent of the working population. Ghana is one of the leading exporters of cocoa and a significant exporter of commodities such as gold, gems and lumber (Quaicoe et al. 2017). Formerly a British colony known as the Gold Coast, was led to independence by future president Kwame Nkrumah on the 6th of March 1957 becoming the first black nation in sub-Saharan Africa to achieve independence from colonial rule.

Table 3 Important demographic details of Ghana (GSS 2012)

Capital:	**Accra**
Regions:	Ten
Population:	24.2 million (2010 census)
Area:	Total 238,535 km2
Water (%):	4.61
Official language:	English
Major Ethnic Groups:	Ashanti, Dagbani, Ewe and Ga
Life expectancy:	57 years (men), 61 years (women)
Currency:	Ghana cedi
Neighbouring countries:	Ivory Coast, Burkina Faso, Togo

Ghana is divided into 10 administrative regions (Figure 9) with Greater Accra Region, where the study has been conducted, being the smallest (MoFA 2011). It occupies 3,245 square kilometres which represents 1.36 % of the total country´s area. Even though it covers only small part of the total land, 16.30 % of the Ghanaian population live just here, making the average population density in this area around 1235,8 persons/km^2 (MoFA 2013).

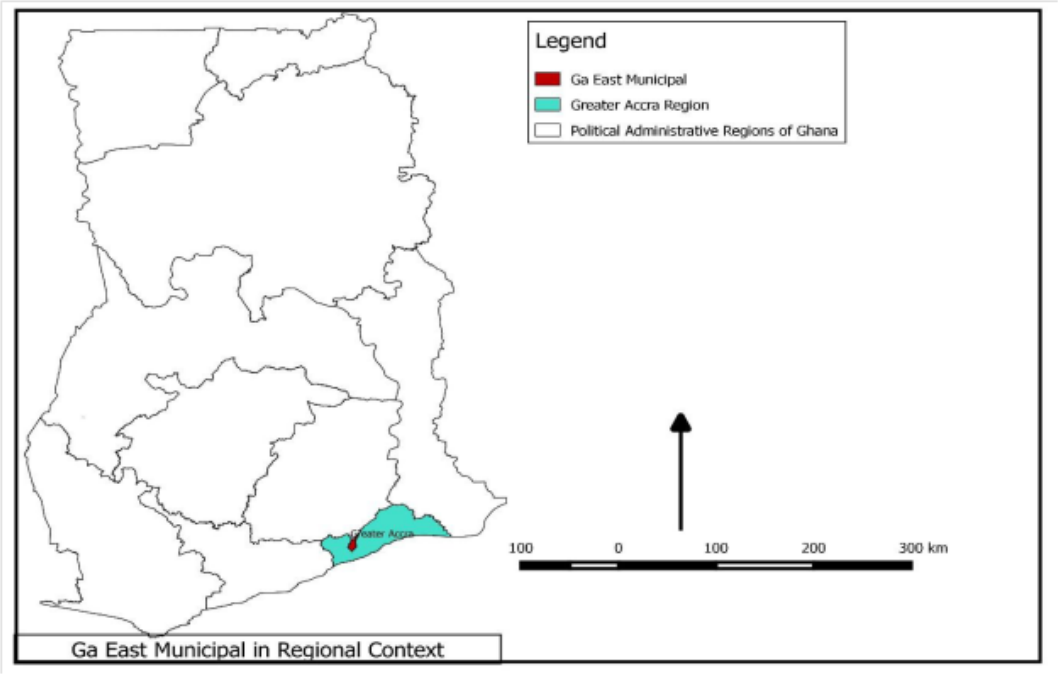

Figure 9 Ga East Municipal in Regional Context (GSS 2012)

Greater Accra Region is made up of 16 administrative areas with Ga East being the target area of this study (Figure 10). This district is located at the northern part of Greater Accra Region with Abokobi being the most important city.

The municipality falls in the savannah agro-ecological zone which in this area is characterized by two rainfall seasons. The first one peaks from May to August, and the

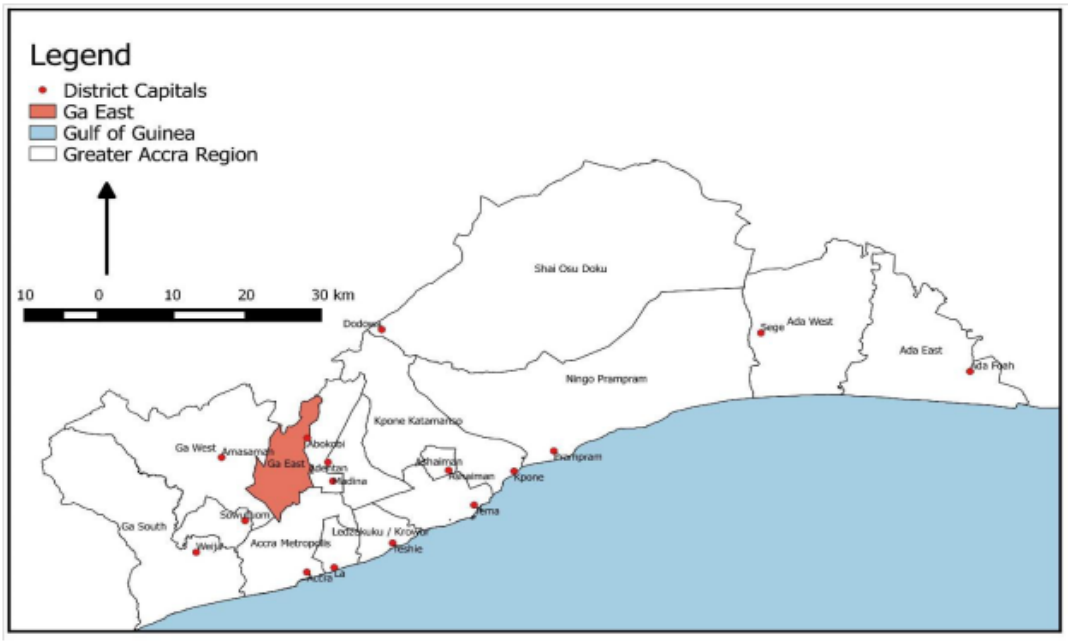

Figure 10 Ga East Municipal in National Context (GSS 2012)

second rainfall season starts from October to November, with an annual rainfall ranging

from 780 mm to 1200 mm. The hottest months are February and March, just before the rainy season, with a monthly mean temperature of 27˚C (Nyarko 2002). The District has two main vegetation types. The shrub lands occur mostly in the western outskirts and in the north towards the Aburi hills and consist of dense cluster of small trees and shrubs that grow to an average height of about five meters. The grasslands which occur to the southern parts of the municipality are now being encroached mainly because of people, who are moving to this area.

3.2. Data Collection

Data have been collected in July and August 2017. Using snowball sampling method, we have interviewed 30 small-scale farmers from 10 communities in Ga East District. They were Abokobi (5 farmers), Agbogba (4), Ashongman (3), Dome (2), Haatso (3), Kwabenya (4), Oyarifa (2), Pantang (2), Taifa (2), Teima (3) (Figure 11). Data have been obtained during personal visit at the farms with help of semi-structured

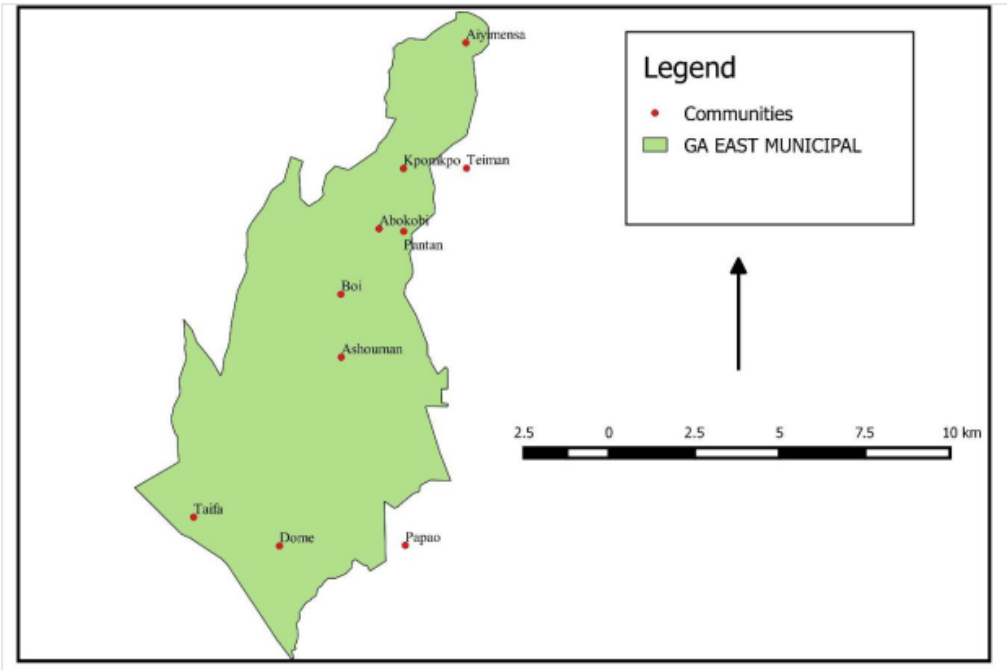

Figure 11 Ga East Municipal Map (GSS 2012)

questionnaires (Appendix 1). Farmers also showed us around their farm, which was crucial to identify management practises such as housing, breeding, feeding, records

keeping etc. Thanks to the personal observation of the farm we were able to see, whether the interviewed farmer was describing the reality about his farm or not.

3.3. Analysis

Data obtained from farmers were analysed via descriptive statistics such as means, frequencies and standard deviation. Qualitative data were analysed by sorting the answers of respondents and subsequent coding, which is a process of identifying a passage in the text or other data, searching and identifying concepts and finding relations between them.

The results are presented in tables and figures. MS Office Excel version 2012 was used for data entry and analysis.

4. Results

4.1. Livestock and mini-livestock farmers

Small-scale farmers in Ga East District were devoted mainly to poultry and pig farming (Table 4). Other animals that were reared on the farms in this area were sheep, goats, cattle, catfish, tilapias, rabbits, grasscutters and snails.

Table 4 Reared animals by farmers in Ga East district

Reared animals	Number of farmers
Poultry	12
Pigs	7
Other livestock	11

Poultry and pig farming were the most abundant in this district, because farmers tried to take advantage of proximity to big markets as well as of increasing demand for chicken meat and pork in Ghana in last years. Accra, the capital city of Ghana, is the most populated area in the country with approximately 4 million inhabitants. This amount of people creates a huge demand for various food products with chicken meat and pork being the ones, which are the most popular. Farmers therefore did not have to establish any marketing strategy, because customers were coming every day to their farm´s gate to buy their chickens or pigs, which was a big advantage.

As shown in Table 5, poultry farmers focused mainly on egg production or on egg production and broiler production together. Only 2 farmers reared only broilers. Poultry farmers got more engaged in egg production, because it is more profitable in comparison to broiler production. Reason why it is so, was mentioned at the beginning of this paper.

Table 5 Focus of poultry farmers in Ga East district

Production	Number of farmers
Egg production	6
Egg and broiler production	4
Broiler production	2

Poultry farmers had on their farms exclusively exotic breeds of layers and broilers. For egg production were used mainly imported breeds such as Lohmann Brown and White leghorn (Figure 12 and 13). These breeds are very productive with average production reaching up to 220 eggs per year, if proper management practises are met.

Figure 13 Lohmann Brown layers (photo by author)

Figure 12 White leghorn layers (photo by author)

Pig farmers bred from 85,72 % imported breeds such as Large White and Landrace. Ashanti Black, a local breed of pigs in Ghana, was used just by 14,28 % of farmers. However, as we can see in Figure 14, farmers used to cross domestic pigs with

imported breeds. These crossbreds were characteristic by higher disease and parasite resistance, they were better mothers, they coped better with local hot and humid climate and their general productivity was improved.

In any case, populations of Black Ashanti pig seemed to be decreasing, which could be a problem for future challenges of pig production in Ghana.

Figure 14 Crossbreds of Ashanti Black and Large White

Farmers who focused on other species of animals did so because their primary goal of farming was not only making money. They reared animals in order to secure partially food for themselves and their families, as a subject of researches, but also because they were enjoying keeping livestock as an important pastime. Table 6 shows other species with their breeds, which we encountered at farms.

Table 6 Livestock breeds and average number of animals per farmer on the farms in Ga East district

Livestock	Breeds	Number of animals	Number of farmers
Cattle	N´Dama, West African Shorthorn,	43 (±29.70)	3

	White Fulani		
Sheep	West African Dwarf sheep, Nungua Blackhead	11 (±2.16)	4
Goats	West African Dwarf goat	23 (±3.74)	4
Pigs	Landrace, Large White, Ashanti Black	66 (±19.91)	7
Ducks	Muscovy	29 (±7.07)	2
Guinea fowls	Helmeted guinea fowl	100 (±28.28)	2
Turkeys	Bronze, Broad Breasted, White	50 (±10.00)	3
Geese	African geese	9 (±7.07)	2
Rabbits	Flemish Giant, Chinchila, California	40 (±19.42)	4
Greater cane rats	*Thryonomys swinderianus*	12 (±4.95)	5
Fish	*Clarias gariepinus, Oreochromis niloticus*	500 (±141.42)	2
Snails	*Achatina achatina*	107 (±7.07)	2

4.1.1. Reasons to breed particular livestock species

Respondents have stated 4 reasons, which determined, why farmers were breeding particular kind of animal and breed. For respondents 1, 2, 3, 7, 8, 9 and 16 the major reason to breed particular animal was that they inherited those animals from their

parents and grandparents. For these respondents was characteristic breeding of cattle, sheep and goats. They were Muslims with only elementary education, they were between 41-59 years old and had long farming experience.

Second reason, which has brought respondents to farming was previous experience with animals. This was case of respondents 17, 22, 23 and 28, who were former greater cane rat hunters, who either got old or hunted out cane rats in their whole area. Therefore, they became greater cane rat farmers, because they had knowledge about cane rat´s ecology and ethology and wanted to take advantage of that in their next occupation.

Respondents 5, 18, 24, 25 and 26 stated, that the reason why they started breeding animals was, that they liked animals. These farmers were all older than 55 years old and farming was for them rather an important pastime activity then an income bringing enterprise. They reared goats, sheep and snails.

That was however a reason for the majority of the farmers. Respondents 4, 6, 10, 11, 12, 13, 14, 15, 19, 20, 21, 27, 29 and 30 answered, that the reason for them to start with farming was income generation. These farmers were young men, between 18 to 40 years old. They had either secondary or tertiary education and because they wanted to take advantage of current increased demand for agricultural products, such as chicken meat, eggs and pork, they focused mainly on poultry and pig farming.

4.1.2. Socioeconomic characteristics of the farmers

Based on answers from the questionnaires, following socio-economic characteristics were found out (see Table 7).

Table 7 Socio-economic characteristics of farmers in Ga East district (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	28	93.33
Female	2	06.67
PURPOSE OF PRODUCTION		
Income generation	20	67,67
Food products to feed family	6	20.00
Off farm (hobby, religion, research)	4	13.33
FARMING EXPERIENCE (YEARS)		
1-5	19	63.33
6-10	5	16.67
11-20	3	10.00
Above 20	3	10.00
LEVEL OF EDUCATION		
None	2	6.67
Elementary	9	30.00
Secondary	10	33.33
Tertiary	9	30.30

As we can see in table above, small-scale livestock farmers in Ga East district in Greater Accra region were predominantly men. There were only two women among 30 interviewed farmers. For 68 % of the farmers was income generation the main purpose of their venture. Six farmers stated that the main purpose of the farming was

supplementation of their family´s diet. Hobby and research were mentioned by 4 respondents. Most of the farmers (63 %) were also in farming for less than for 5 years.

4.2. Management practises

Quality of practises at farms such as housing, feeding, system of breeding or disease control are crucial for every farmer, because they determine, how particular farmer is successful with his farming business. Efforts, which farmers put to particular management practises at their farms, were very variable ranging from respondents, who did not know about basic mechanisms like for example vaccination, to farmers, who improved their farms with sophisticated watering systems.

4.2.1. Housing

Housing or animal shelters in our research area were variable constructions. Farmers usually used diverse materials to construct cages, pens, coops, sties or fences to keep their animals save and well. Pigs and poultry, the most abundant livestock species in Ga East district, were kept in enclosures made of concrete floor and wire mesh walls. Small ruminants such as sheep and goats, that were roaming freely around the house of their owner, were closed for night in pens, made of wooden planks. Rabbits and cane rats were housed in wooden hutches covered with welded mesh from inside, because otherwise they bit through out of the hutch. Cages for rabbits and greater cane rats were also equipped with cans filled with oil, which were covering legs of the hutches, in order to prevent ants infestation (see Figure 15).

Figure 15 Preventive measures against insect infestation

Fish were bred in earth ponds in case of catfish or in cages made of wire mesh in case of tilapias and for breeding of snails were used pits covered with wooden lids.

However, there were significant number of farmers, who did not pay proper attention to housing (see Figure 15 and 16). Improper floor bedding in cattle enclosures or in rabbit hutches were common problems causing animals health problems often leading to decreased production. During dry season there were no problems, but when rainy season started and soil, the cows were standing on, become wet, animals started to have problems with cloven hooves.

Figure 16 Improper housing of White Fulani cattle

Figure 17 Inadequate breeding boxes for rabbits

4.2.2. Feeding

Feeding was the biggest challenge for all of the interviewed farmers. Especially for poultry, pigs and fish farmers, who were feeding their animals with complete feed mixtures based mainly on imported soya and fish meal, was feeding their animals properly a big problem. In addition to general high prices of imported feeds in Ghana there were also problems with its availability. Especially at the beginning of the dry season, which is in southern Ghana during November and December. At this moment

large-scale farms, trying to make supplies for upcoming unfavourable part of the year, come to the feed mills and buy feeds in bulks. Because most of the compound feeds used in poultry, fish and pig farming are imported this creates temporary decrease in quantity of feeds and increase in prices, which gets back again on the normal level very slowly. Small-scale farmers therefore cannot usually afford more expensive feeds for their animals, which leads to unbalanced nutrition followed by decreased production. In more remote areas from big cities like Accra or Kumasi is the problem with supplies at feeding mills even bigger mainly because of unreliable infrastructure causing the farming on such farms even more problematic.

As we can see in Figure 17, 19 % of the poultry farmers experienced also unfair actions from feed mill operators. They were cheating either by adulteration of the feed formulas, which then contained usually less proteins or with the weight of the bags with feeds, which contained less feeds then farmers have paid for.

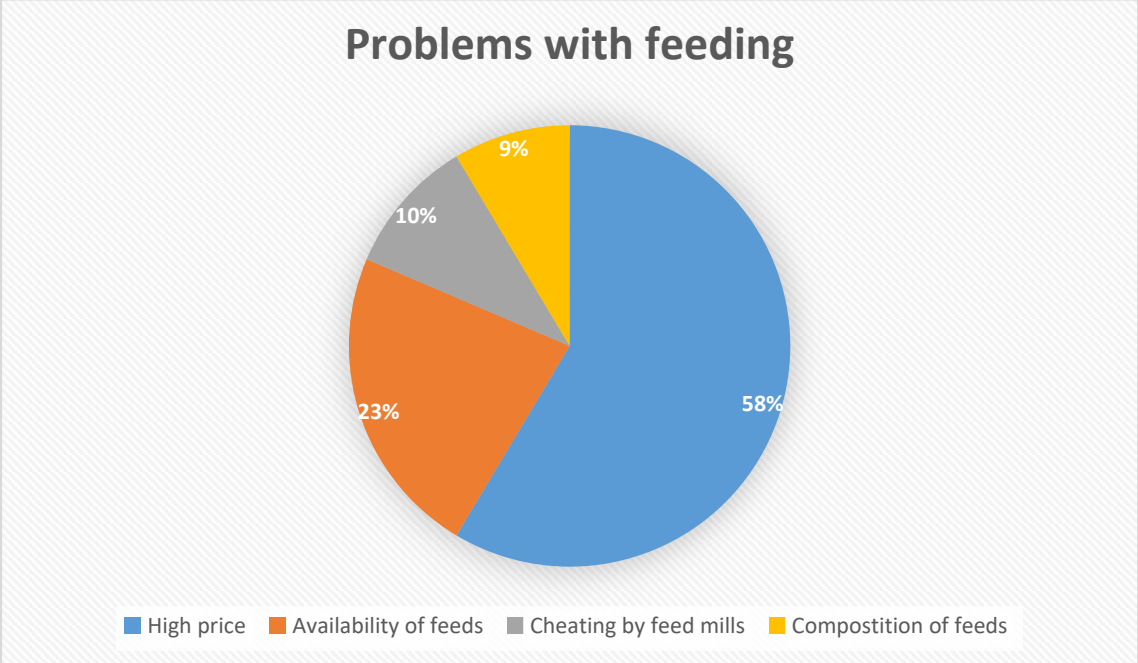

Figure 18 Problems faced by poultry farmers in Ga East district related to feeding

Pig farmers were feeding their animals mainly with imported maize and soya or fish meal and mixture of kitchen and household leftovers like for examples peels from fruits or tubers. They also fed pigs by-products from industrial production, which was for example the case of sorghum malt purchased from local breweries. Farmers however

did not have facilities for proper storing of such materials, which often lead to fast deterioration (see Figure 18).

Figure 19 Mouldy sorghum malt, which was used for feeding pigs

Cattle farmers set out every day early in the morning and with help of hired herdsmen they grazed cattle in areas, which were often far away from their homestead, while goats and sheep in search for grazing were roaming freely around their farmers house.

Greater cane rat, rabbit and snail farmers relied on crop residues like for example corn cobs, plantains and cassava peels as well as on fruits, grasses and legumes gathered from nearby environment.

Fish were fed exclusively with imported pelleted feeds, which even though were on average 30 % more expensive, were preferred by fish farmers. The main reason apart from having higher quality was, that locally produced fish feeds were not extruded.

4.2.3. Disease control and breeding system

The most common diseases farmers in Greater Accra region came in contact with were Newcastle disease, Avian influenza, Infectious Bursal disease (Gumboro Disease), Animal trypanosomosis called “nagana”, coccidiosis and helminthiasis. Farmers bought

medicaments and drugs from local suppliers or in case of vaccinations they called either government para-vets or private para-vets. Table 8 however shows the commonest reasons, why farmers did not cure their animals. High prices of veterinary services were mentioned by 17 respondents, indicating that expensive veterinaries were the biggest challenge to have a proper disease control on their farms. Farmers also stated other reasons such as lack of knowledge about diseases and their symptoms, late reporting of sick animals, unavailability of drugs and necessary equipment and lack of transport.

Table 8 Constrains to veterinary work in Ga East district

Reason	Number of farmers
Lack of transport	4
Late reporting of animals with problems	6
Lack of drugs and equipment	5
Lack of knowledge	10
High prices of veterinary services	17

What concerns breeding system, farmers did not develop any strategy for breeding their animals. They kept all of their animals together regardless of their sex or age. This was case of sheep, goat and cattle farmers. Their animals therefore mated between themselves without any control, which resulted often to overusing of the females.

4.3. Biggest problems related to farming

Most of the farmers stated as the biggest challenge, they have to face, unstable prices of the feedstuffs on the market. This was related mainly to poultry, fish and pig farmers, who rely on imported compound feeds throughout the year.

Sheep and goat farmers considered the biggest problem, they had to deal with, stealing of their animals. Goats and sheep were usually kept on free range system, meaning that animals freely roamed around the house or village, where their owner

lived. In order to find fresh pastures animals might sometimes get far away from their home area and may become an easy target of various thefts. Usually farmer had to put a big effort to find again his animals and bring them back.

Cattle farmers experienced similar problems with the subject of stealing being not only animals themselves, but rather milk of milking cows, which was being stolen by their herdsmen. All of the farmers, no matter of what animals their reared or kept, struggled also with lack of drugs and medicaments. This is the case mainly for vaccines against coccidiosis, trypanosomosis and Newcastle disease.

Other problems, farmers mentioned were lack of space and therefore no opportunity to expand, price of the animals and their products at the markets and low productivity of their animals.

4.4. Possible ways how to improve socio-economic status of the farms

My study revealed 6 measures, which have been taken by farmers to improve socio-economic status of their farm (see Figure 19). Production of own feedstuffs was mentioned by 14 respondents. This practise allowed farmers to became independent in terms of purchasing feeds from commercial mills or suppliers. Rearing more productive, usually imported breeds, helped 11 farmers to increase income and became more profitable. Seven respondents purchased newest farming technology. For 4 farmers was important, in order to improve their economic situation, to create and unite themselves in local producer association. This led them to buy feeds and vaccinations in bigger quantities and therefore for better price. Incorporation of nitrogen fixing plants such as *Leucaena leucocephala* or *Sesbania spp*. was mentioned by 4 farmers and 4 farmers stated, that processing of their own production into products such as dried meat or salted meat was a practise which helped them improve their economic situation.

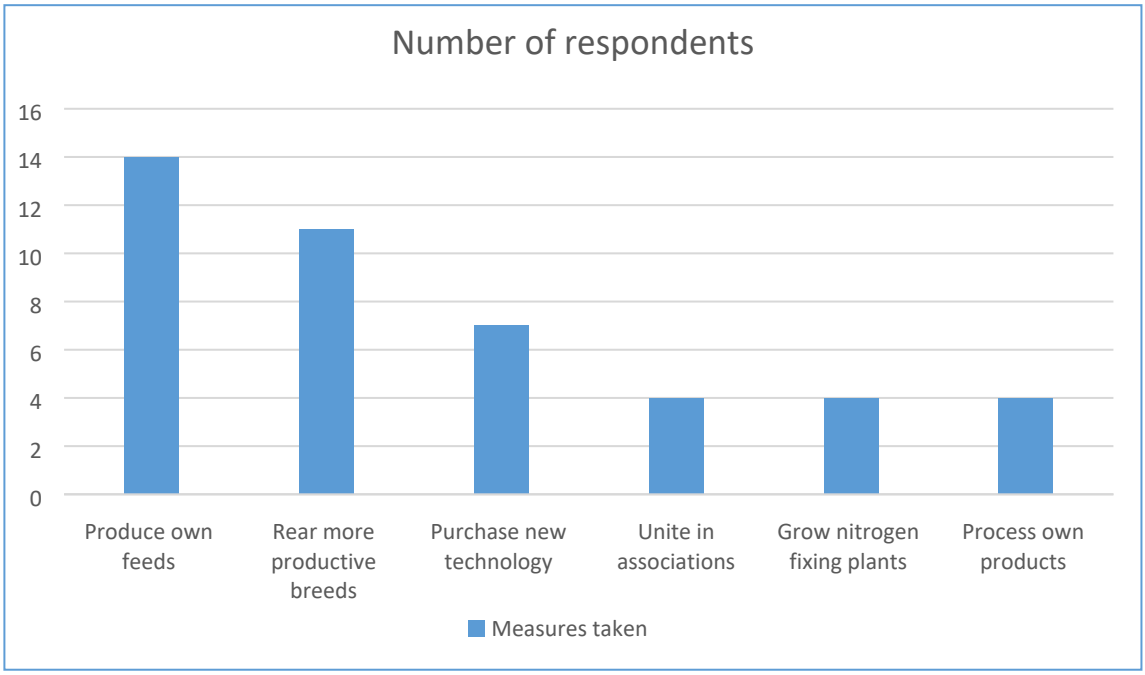

Figure 20 Measures taken to improve socio-economic situation of the farm

5. Discussion

Main aim of my thesis was to determine livestock and mini-livestock species and breeds diversity on small-scale farms in Ga East district in Greater Accra region in Ghana. We found out that on 30 small-scale farms which were located in Ga East district farmers bred 13 livestock species and 27 breeds. Cattle was represented by breeds N´Dama, African Shorthorn and White Fulani. Sheep were represented by breeds West African Dwarf and Nungua Blackhead. Goats were represented just by one breed, which was West African Dwarf goat. Pigs were represented by Landrace, Large White and Ashanti Black. Poultry farmers kept Helmeted guinea fowls, Muscovy ducks, Bronze, Broad Breasted and White turkeys, African geese, White Leghorn, Lohmann Brown and Cocro layers and Cobb and Hypeco broilers. Rabbits were represented by Flemish Giant, Chinchilla and California breed. What concerns greater cane rats, farmers bred *Thryonomys swinderianus* species, fish species *Clarias gariepinus* and *Oreochromis niloticus* and *Achatina achatina*, which is a species of a local land snail.

As we can see, diversity of species and breeds of livestock among local farmers is not high, which is result to which came also (Kuivanen et al. 2016) with his study from northern Ghana. Farmers focused on small number of species, which are from 44 % imported breeds, for breeding of these improved breeds is the logical and fastest way how to improve the performance of local livestock populations (Leroy et al. 2016).

On the other hand, farmers who bred cattle, sheep and goats relied exclusively (83 %) on local breeds such as West African Dwarf goat and West African Dwarf sheep, even though their performance is generally low (Vohradský 1999). The reason is that these breeds are naturally adapted to local harsh conditions, poor management practises, insufficient feeding and presence of sleeping disease. Farmers do not have enough means to invest in their business or in the way they rear livestock for generations, because for these respondents the motivation to start with farming was, that they inherited animals from their relatives.

My survey revealed, that 85,71 % small-scale pig farmers, who were interviewed, keep imported breeds. This fact supports what was found out by Osei-Amponsah et al.

(2017), which is that Ashanti Black, once very common local breed of pig, might get endangered and possibly extinct in near future. Farmers simply prefer bigger breeds such as Large White or Landrace with their fast growth rates and superior reproductive performance. Ghanaian government should therefore take measures to prevent Black Ashanti pig from extinction, because we might use its abilities such as hardiness, capability to forage on fibrous feeds, resistance to the majority of local diseases and parasites, good mothering ability and low demand for feeding (Abdul-Rahman et al. 2016) in future agricultural challenges.

However, the problem with improved breeds is, that in order to take advantage of their genetic potential they must be supported with adequate husbandry practises such as proper housing, feeding and disease control (Djoharjani & Ibrahim 1993) which is for a small-scale farmers in Ga East district a serious problem. About 58 % of the poultry farmers, who were the most abundant farmers in our research area, struggle with high prices of feeds and 23% of the poultry farmers have problems with availability of feeds. Therefore, although farmers keep high productive breeds of layers such as White Leghorn, animals are in their production limited by poor husbandry practises. This finding, that feeding is the biggest problem among small-scale farmers, is similar to what described in his work Anang et al. (2013). Interesting practise might be incorporation of insects in feeding of livestock animals, from which seems to be the most convenient Black soldier fly (*Hermetia illucens)* (Banson et al. 2014). BSF larvae are capable of converting organic waste into body biomass rich in proteins, which can be then fed to livestock such as poultry, pigs or fish (Supriyatna et al. 2018). Farmers can therefore use ubiquitous biowaste to produce cheap and high-quality feed for their animals.

Problem is that poultry small-scale farmers buy only imported feeds and rely therefore on imports from abroad, which makes them highly vulnerable to any problems related to importation of feedstuff to Ghana. Respondent 4, 6, 12 and 13 face this challenge by producing their own feeds on their farms, while farmer 20, 21, 29 and 30 united themselves in association, which allows them to buy feedstuff from feed mills under better conditions. These practises are a way how to make themselves less

dependent, but it is necessary, so that more farmers incorporate similar measures in their management systems.

We experienced that, general low productivity of Ghanaian small-scale farming sector as well as in other parts of Africa is just due to improper care, farmers devote to their animals (Chapoto et. al 2018). This relates highly with education of farmers. In my study we found out, that only about 30 % of farmers had tertiary level of education.

Local stakeholders should therefore consider participating in projects such as farmer field schools. FFS project is run by the Food and Agriculture Organization (FAO) in order to developing mechanisms for cost effectiveness and sustainability of small-scale farmers. Davis et al. (2012) revealed in his study from East Africa, that participation in FFS projects increased producer's income by 61 %. Such projects can significantly increase general productivity and efficiency especially among farmers with limited literacy.

6. Conclusions

Small-scale livestock farmers play a crucial role in Ghanaian economy, because they are responsible for large portion of domestic production in Ghana. Their productivity however remains low due to improper management practises on their farms. Farmers in Ga East district struggle mainly with feeding of their animals, proper housing and disease control. Problem is also decreasing diversity among livestock species and breeds, which might be a problem in future, when local farmers will face climatic changes of the environments and they will not be able to use qualities of local livestock breeds, which have been adapting to local conditions for thousands years. Farmers also do not feel supported by neither local stakeholder nor central government, which makes the problems for them even more difficult to face. Local government representatives should pay more attention to small-scale farmers, for the well-being of the country is hugely dependent just on small-scale farmers and their families, because they represent a significant part of the population. Ghanaian government should also implement measures, which would protect the market with agricultural products so that it cannot happen that chicken produced in Ghana by its own farmers is 30 % more expensive than imported frozen chicken.

Finding an approach that will adequately address these issues is a special challenge not only in Ghana but also in the whole Africa, because poverty grows and productivity declines on the whole continent.

Other studies, which are going to deal with this topic should focus mainly on ways how to improve husbandry practices carried out by small-scale farmers in practical ways, for efforts of various governmental as well as international projects were not successful.

7. References

Abdul-Rahman II. 2017. Reproductive performance of West African Dwarf goats under guinea Savannah conditions. Ghana Journal of Science **5**:35-42.

Abdul-Rahman II, Semaha P, Yaro M. 2016. Pre and post-weaning growth performance of Ashanti Black pigs under Guinea Savanna conditions. **28**:Article No. 14.

Adam Y, Marcotty T, Cecchi G, Mahama CI, Solano P, Bengaly Z, Van den Bossche P. 2012. Bovine trypanosomosis in the Upper West Region of Ghana: Entomological, parasitological and serological cross-sectional surveys. **92**:462-468.

Addah W, Dzewu RRK, Alenyorege B. 2016. Effects of dietary restriction followed by high dietary energy or protein on compensatory growth of Ashanti Black × Large White crossbred weaner pigs. Tropical Animal Health and Production **48**:145-150.

Adu EK, Alhassan WS, Nelson FS. 1999. Smallholder Farming of the Greater Cane Rat, Thryonomys swinderianus, Temminck, in Southern Ghana: A Baseline Survey of Management Practices. Tropical Animal Health and Production **31**:223-232.

Agbogidi OM and Okonta BC. 2011. Reducing poverty through snail farming inNigeria, Agriculture and Biology Journal of North America, **2**, 169–172.Anang BT, Yeboah C, Agbolosu AA. 2013. PROFITABILITY OF BROILER AND LAYER PRODUCTION IN THE BRONG AHAFO REGION OF GHANA. Journal of Agricultural and Biological Science **8**:423-430.

Annor S Y and Kusi C (2008). Factors Influencing the Adoption of Grasscutter Production in the Brong Ahafo Region of Ghana. Volume 20, Article #141. Retrieved March 10, 2013, from http://www.lrrd.Org/lrrd20/9.

Ansah T, Agbolosu AA, Teye GA, Akwasi A, Opoku-Agyeman M. 2012. Evaluation of Corn Cob on the Growth Performance of Grasscutter (Thryonomys swinderianus). Scientific Papers: Animal Science & Biotechnologies / Lucrari Stiintifice: Zootehnie si Biotehnologii **45**:7-10.

Antholt CH. 1994. Getting ready for the twenty-first century : technical change and institutional modernization in agriculture. Washington, D.C.

Banson K, Nketsia-Tabiri J, Anno K, Kofi Dagbui E. 2014. Economic and Market Analysis of Swine Rearing and Pork Production in Ghana. Journal of Life Sciences **Vol. 8**:699-708.

Baruwa OI, Sofoluwe NA. 2016. Profitability and resource use efficiency of guinea fowl (Numida meleagris) production under tropical conditions. Journal of Livestock Science **7**:97-106.

Bationo A, Kihara J, Vanlauwe B, Waswa B, Kimetu J. 2007. Soil organic carbon dynamics, functions and management in West African agro-ecosystems. Agricultural Systems **94**:13-25.

Birteeb TP, Danquah BA, Salifu ARS. 2015. Growth Performance of West African Dwarf Goats Reared in the Transitional Zone of Ghana. **9**:370-378.

Blay, E.T., Ofori, B.D., Heloo, J., Ofori, J.B. and Nartey, E., 2004. Agrodiversity within and without conserved forests for enhancing rural livelihoods. In: Gyasi E.A., Kranjac-Berisavljevic G, Baly E.T, Oduro, W. (eds), Managing Agrodiversity the Traditional Way: Lessons from West Africa in Sustainable Use of Biodiversity and related natural Resources, (Tokyo, United Nations University Press).

Cervantes-Godoy D, Dewbre J 2010. Economic Importance of Agriculture for Sustainable Development and Poverty Reduction: Findings from a Case Study of Ghana.

Cobbinah, J.R., Vink, A. and Onwuka B., 2008. Snail Farming: Production, Processing and Marketing, (Agromisia Foundation, Agrodok 47 and CTA, Wageningen.) First Edition.

Djoharjani, T., and M. N. M. Ibrahim. "Housing and management of dairy cattle in small scale farms of east java, in Indonesia." Asian-Australasian Journal of Animal Sciences 6.3(1993): 389-394.

FAO. 2013. FAOSTAT data. Food and Agriculture Organization, Rome. Available at: http://faostat.fao.org/ (accessed 29/09/2018).

Chapoto A, Houssou N, Asante-Addo C, Mabiso A. 2018. Can smallholder farmers grow? Perspectives from the rise of indigenous small-scale farmers in Ghana. International Association of Agricultural Economists.

Chiejina SN, Behnke JM, Fakae BB. 2015. Haemonchotolerance in West African Dwarf goats: contribution to sustainable, anthelmintics-free helminth control in traditionally managed Nigerian dwarf goats. Parasite (Paris, France) **22**:7-7.

Dagnachew S, Bezie M, Terefe G, Abebe G, Barry JD, Goddeeris BM. 2015. Comparative clinico-haematological analysis in young Zebu cattle experimentally infected with Trypanosoma vivax isolates from tsetse infested and non-tsetse infested areas of Northwest Ethiopia. Acta Veterinaria Scandinavica **57**:24.

Davis K, Nkonya E, Kato E, Mekonnen DA, Odendo M, Miiro R, Nkuba J. (2012). Impact of farmer field schools on agricultural productivity and poverty in East Africa. World Development, **40**(2), 402-413.

De Boer H. 1990. A world dictionary of livestock breeds, types and varieties. Livestock Production Science **25**:269-270.

Djoharjani ST, Ibrahim MNM. 1993. Housing and management of dairy cattle in small scale farms of East Java, in Indonesia. Asian-Australasian journal of animal sciences.

Fianu FK, Addae PC, Adjorlolo L. 1996. Sheep rearing under tree crop plantation in Ghana's forest zone: Problems and prospects.

Ganyo EY, Boampong JN, Masiga DK, Villinger J, Turkson PK. 2018. Haematology of N'Dama and West African Shorthorn cattle herds under natural Trypanosoma vivax challenge in Ghana. F1000Research **7**:314-314.

Ghana Statistical Service. 2012. The 2010 population & housing census summary report of final results. Ghana Statistical Service: 45-103.

Jabbar MA, Swallow BM, d'Iteren GDM, Busari AA. 1998. Farmer preferences and market values of cattle breeds of West and Central Africa.21.

Jori F, Mensah G and Adjanohoun E Grasscutter production: an example of rational exploitation of wildlife. Biodiversity and conservation, **4**: 257-265. 1995.

Kabuga JD, Akowuah F. 1991. Reproductive performance of Djallonke × Sahelian crossbred ewes in Ghana. **5**:245-254.

Karikari P, Blasu E. 2009. Influence of Nutritional Flushing Prior to Mating on the Performance of West African Dwarf Goats Mated in the Rainy Season. Livestock Research for Rural Development **21**:103.

Kassam, L. (2014). Aquaculture and food security, poverty alleviation and nutrition in Ghana: Case study prepared for the Aquaculture for Food Security, Poverty Alleviation and Nutrition project. World Fish, Penang, Malaysia. Project Report: 2014-48.

Koney EBM 2004. Livestock Production and Health in Ghana. Advent press, Accra, Ghana.

Kosgey IS, Okeyo AM. 2007. Genetic improvement of small ruminants in low-input, smallholder production systems: Technical and infrastructural issues. Special Issue: The Outlook of Quantitatuve and Molecular Genetics Applications in Improving Sheep and Goats **70**:76-88.

Kosgey IS, Rowlands GJ, van Arendonk JAM, Baker RL. 2008. Small ruminant production in smallholder and pastoral/extensive farming systems in Kenya. **77**:11-24.

Kuivanen KS, Alvarez S, Michalscheck M, Adjei-Nsiah S, Descheemaeker K, Mellon-Bedi S, Groot JCJ. 2016. Characterising the diversity of smallholder farming systems and their constraints and opportunities for innovation: A case study from the Northern Region, Ghana. NJAS - Wageningen Journal of Life Sciences **78**:153-166.

König ZE, Mirkena T, Strandberg E, Audho J, Ojango J, Malmfors B, Okeyo AM, J. P. 2016. Participatory definition of breeding objectives for sheep breeds under pastoral systems—the case of Red Maasai and Dorper sheep in Kenya. Tropical Animal Health and Production **48**:9-20.

Leroy G, Baumung R, Boettcher P, Scherf B, Hoffmann I. 2016. Review: Sustainability of crossbreeding in developing countries; definitely not like crossing a meadow…. animal **10**:262-273.

Mason IL 1988. A world dictionary of livestock breeds, types, and varieties / by I.L. Mason. CAB International, Wallingford, Oxon, UK.

Mason IL 2002. Mason's world dictionary of livestock breeds, types and varieties. CABI Pub., Wallingford, UK.

Maule JP 1990 THE CATTLE OF THE TROPICS. University of Edinburgh, Edinburgh.

Ministry of Food and Agriculture. 2011. Agriculture in Ghana. Facts and figures: Ministry of Food and Agriculture, Statistical Research and Information Directorate.

Ministry of Food and Agriculture. 2013. Agriculture in Ghana. Facts and figures: Ministry Food and Agriculture, Statistical Research and Information Directorate.

Munyua HM, Stilwell C. 2013. Three ways of knowing: Agricultural knowledge systems of small-scale farmers in Africa with reference to Kenya. Library and Information Science Research **35**:326-337.

Ngenwi, A.A., Mafeni, J.M., Etchu, K.A. and Oben, F.T., 2010. Characteristics of snail farmers and constraints to increased production in West Africa, African Journal of Environmental Science and Technology, **4**, 274–278.

Ngere LO. 1973. Size and growth rate of the West African Dwarf sheep and a new breed, the Nungua-Black-Head of Ghana. Ghana journal of agricultural science:p.113-117.

Ngere OL, Aboagye G. 1981. Reproductive performance of West African Dwarf and the Nungu Black Head sheep of Ghana. Animal Production **33**:249-252.

Nyarko, B. K. (2002). Application of a Rational Model in GIS for Flood Risk Assessment in Accra, Ghana. Journal of Spatial Hydrology, **2**, pp. 1-14.

Nyina-Wamwiza L, Milla S, Pierrard MA, Rurangwa E, Mandiki SNM, Van Look KJW, Kestemont P. 2012. Research article: Partial and total fish meal replacement by agricultural products in the diets improve sperm quality in African catfish (Clarias gariepinus). Theriogenology **77**:184-194.

Odeniran PO, Ademola IO. 2018. A meta-analysis of the prevalence of African animal trypanosomiasis in Nigeria from 1960 to 2017. Parasites & Vectors **11**:1-12.

Odeyinka SM, Oyedele OJ, Adeleke TO and Odedire JA. 2008. Reproductive performance of rabbits fed Moringa oleifera as a replacement for Centrosema pubescens. 9th World Rabbit Congress Verona-Italy, June 10-13, pp. 411-416.

Ogunniyi, L. T., 2009. Economic analysis of snail production in Ibadan, Oyo State. International Journal of Agricultural Economics and Rural Development, **2**, 26–34

Osei-Amponsah R, Skinner BM, Adjei DO, Bauer J, Larson G, Affara NA, Sargent CA (2017). Origin and phylogenetic status of the local Ashanti Dwarf pig (ADP) of Ghana based on genetic analysis. BMC genomics, 18(1), 193. doi:10.1186/s12864-017-3536-6

Osaer S, Goossens B, Clifford DJ, Kora S, Kassama M. 1994. A comparison of the susceptibility of Djallonké sheep and West African Dwarf goats to experimental infection with two different strains of Trypanosoma congolense. **51**:191-204.

Osei S, Effah-Baah K. 1989. Reproductive performances of N'dama and West African shorthorn cattle in the humid forest zone of Ghana. **66**:256-258.

Osei-Amponsah R, Kayang B, Naazie A, Arthur P, Barchia I. 2011. Characterisation of local Ghanaian chickens: Growth performance evaluation based on Richards growth model and genetic size scaling. Tropical animal health and production **43**:1195-1201.

Osei-Amponsah R, Skinner BM, Adjei DO, Bauer J, Larson G, Affara NA, Sargent CA. 2017. Origin and phylogenetic status of the local Ashanti Dwarf pig (ADP) of Ghana based on genetic analysis. BMC genomics **18**:193-193.

Padhi M. 2016. Importance of Indigenous Breeds of Chicken for Rural Economy and Their Improvements for Higher Production Performance. Scientifica **2016**:1-9.

Pirchner F. 2001. Book review: Breeding for disease resistance in farm animals. 2nd edn. R. F. E. Axford, S. C. Bishop, F.W. Nicholas, J. B. Owen, ed. CABI Publishers, Wallingford Oxon OX10 8 DE. 418 p. Journal of Animal Breeding & Genetics **118**:378.

Quaicoe A, Aboagye AQQ, Bokpin GA. 2017. Assessing the impact of export processing zones on economic growth in Ghana. Research in International Business and Finance **42**:1150-1163.

Rege E, Tawah C. 1999. The state of African cattle genetic resources II. Geographical distribution, characteristics and uses of present-day breeds and strains. **26**:1-25.

Rege JEO, Aboagye GS, Tawah CL. 1994. Shorthorn cattle of West and Central Africa, 1: origin, distribution, classification and population statistics.2.

Rurangwa E, Agyakwah SK, Boon H, Bolman BC (2015) Development of aquaculture in Ghana, analysis of the fish value chain and potential business cases. IMARES report C021/15.

Salau SA, Yusuf OJ, Apata DF, Adesina OM. 2017. A Binary Logit Estimation of Factors Influencing Awareness about Grasscutter Farming among Rural and Sub-urban Households in Kwara State, Nigeria. World Journal of Agricultural Research **5**: 299- 304.

Salifu S. 2014. Reproductive performance od Djallonké sheep in the Northern region of Ghana. Page 137. Kwame Nkrumah University of Science and Technology, Kumasi, Kumasi.

Sam M. 2016. Family farming in sub-Saharan Africa: its contribution to agriculture, food security and rural development. International Policy Centre for Inclusive Growth.

Sinyolo S, Mudhara M. 2018. Farmer groups and inorganic fertiliser use among smallholders in rural South Africa. South African Journal of Science:1.

SRID 2014. Agriculture in Ghana. Facts and Figures. Statistical Research and Information Directorate, Ministry of Food and Agriculture, Accra-Ghana.

Supriyatna A, Kurrahman OT, Cahyanto T, Yuliawati A & Kulsum Y. 2018. The Potency of Black Soldier Larvae (Hermetia illucens L.) as a Source of Protein for Livestock Feed. Biosaintifika: Journal of Biology & Biology Education, **10**(2), 448-454.

Tawah CL, Rege E. 1996. White Fulani cattle of West and Central Africa. **17**:127-145.

Traoré A, et al. 2008. Multivariate characterization of morphological traits in Burkina Faso sheep. **80**:62-67.

Traoré SA, Markemann A, Reiber C, Piepho HP, Valle Zárate A. 2017. Production objectives, trait and breed preferences of farmers keeping N'Dama, Fulani Zebu and crossbred cattle and implications for breeding programs. animal **11**:687-695.

Traoré SA, Reiber C, Zárate AV. 2018. Productive and economic performance of endemic N'Dama cattle in southern Mali compared to Fulani Zebu and their crossbreds. Livestock Science **209**:77-85.

Umutoni C, A.A. A, G.J. S. 2015. Evaluation of feed resources in mixed crop-livestock systems in Sudano-Sahelian zone of Mali in West Africa / International Journal of Livestock Research.

Vohradský F. 1999. Místní plemena domácích zvířat tropů a subtropů. Academia. Praha.

Wilson RT. 1991. Small ruminant production and the small ruminant genetic resource in tropical Africa.

Yaro M. 2017. Characterisation of the Djallonke Sheep Breed in Ghana using Molecular Markers.

Appendices

List of the Appendices:

Appendix 1: Livestock inventory questionnaire

Appendix 2: Additional pictures from the survey

Appendix 1: Livestock inventory questionnaire

All answers and information obtained in this questionnaire will be used only for elaboration of my Diploma thesis with the name "Livestock inventory of small-scale farms in Ghana".

Name of respondent……

Address of respondent…….

1. General information

1.1. Sex a) Man b) Woman

1.2. Age a) 18-25 b) 26-40 c) 41-59 d) 60+

1.3. Education a) elementary school b) secondary school c) university

1.4. Why did you become a farmer?

1.5. How did you start?

1.6. How many years do you work as a farmer?

2. Farm description

2.1. What is the size of your farm? a) <1ha

b) 1-2ha

c) >2ha

2.2. What animals do you breed on your farm?

2.3. How many animals do you have on your farm?

2.4. Where did you get them?

2.5. For what price do you usually buy them?

2.6. Why did you choose these particular animals and breeds?

2.7. For what purposes do you farm them?

3. Economic status

3.1. Do you have problems with selling animals/their products?

3.2. How do you search for customers?

3.3. What is “fair price” for you?

3.4. Can you describe items, which represent your costs?

3.5. What are the largest obstacles you must overcome?

3.6. Do you feel supported by local organizations/government?

3.7. Where do you think are your weakest points concerning your farm? (management, diseases control)

3.8. How do you keep records?

3.9. What is your income per a week/month/year?

3.10. Is farming the only source of your/your family income?

3.11. What do you think of farming as a profession?

Thank you for your cooperation

Appendix 2: Additional pictures from the survey

Achatina achatina (photo by author)

Leucena leucocephala (photo by author)