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Livestock production: purposes, practices, and challenges in Sierra Leone.

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The study's goals were to investigate the functions of livestock production at the household level, management practices, and constraints impeding livestock development in rural Sierra Leone. The data was analyzed using SPSS version 23.0 after 345 consenting livestock farmers completed a semi-structured questionnaire. The results of the study showed that 56.5%, 59.0%, 60.0%, 71.9%, 55.7%, and 91.3% of the respondents were male, Muslims, youths, married, illiterate, and household heads respectively. Income, education, tradition, food, and religion were the primary purposes for rearing livestock at household levels. 84.1% of the farmers were mainly dependent on free-grazing with little or no supplementation. The results also revealed that majority of the poultry owners and keepers were women while small ruminants and pigs were predominantly owned by men. All respondents kept local breeds and more than 50% of the parent stock were obtained by purchasing. The research further indicated that 43.5% of the farmers kept goats and poultry with young animals accounting for more than half of the flock size. Good husbandry practices like adequate feeding, water provision, disease prevention and control, and marketing were poorly adhere to. Diseases, lack treatment services, high mortality, neighbor conflict, theft, feed shortages, insufficient water supply, and predation were the hindrances identified in livestock productivity in the study area.

Keywords: Disease, Feed Scarcity, Flock, Livelihood, Management, Marketing, Mortality, Supplementation, Theft

INTRODUCTION

Globally, livestock production (LP) plays a critical role in food security, poverty alleviation, economic development, job creation, social progress, and gender equality (Molina-Flores et al., 2020; Otte et al., 2019). Approximately, livestock provides one-third of animal protein, 17% calories for human consumption, employs 1.3 billion people, and contributes 40% of GDP globally (Popp et al., 2010; World Bank, 2009; Thornton et al., 2006; Rosegrant et al., 2009). The rapid increase in human population caused by rapid urbanization, as well as the quality of life, economic desire, and social lifestyle, have all contributed to increased pressure on LP, particularly in low-income countries. According to Brears (2017), the effect of urbanization, along with the demographic changes that accompany it, may result in

food insecurity and malnutrition.

Poverty and unequal distribution of national resources are the primary reasons why millions of Africans, especially in poorer countries, turn to agriculture, particularly livestock rearing, as a means of meeting their most basic needs. For livelihoods and economic development, a large number of African countries depend heavily on livestock production.

Approximately 52% of Africa's population and nearly 100% of Sub-Saharan Africa's population depend on livestock for a living (Otte and Upton, 2005). In low-income countries, LP is the fastest-growing portion of agriculture, with a 33% rise in GDP (Thornton, 2010). Household food demand, economic development, poverty reduction, sociological and religious needs, and the empowerment of most African countries are all influenced by LP (Molina-Flores et al., 2020). LP offers high quality animal protein, a consistent flow of household revenue, social prestige, and a special choice of livestock species for cultural and traditional practices for many rural resource-poor farmers. Despite

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LP accomplishes multiple functions in Africa and beyond, the sector is hindered by many factors such as weak institutional support, environmental constraints, ineffective policy implementation, and traditional practices.

Sierra Leone has a geographical land area of 72,000 km² and a population of 7, 092,113 people, with an average annual growth rate of 3.2% between 2004 and 2015 (SSL, 2015). 59.0% of this population lives in rural areas, 70% lives in poverty, and 83% and 39% of the rural population, respectively, face the highest rate and prevalence of poverty (FAO, 2016). Sierra Leone is situated on Africa's west coast, between latitudes 6°55' and 10°200' N and longitudes 10°16' and 13°18' W, with an average annual temperature of 23-35°C (FAO, 2016). Sierra Leoneans depend on agriculture for 58% of their income, with 92% practicing some form of animal husbandry (SSL, 2015 and Senahoun et al., 2014).

Agriculture (livestock, crop, fisheries, and forestry) is the country's mainstay, employing roughly two-thirds of the workforce and accounting for 50.0% of GDP, while the livestock sector accounts for 5.7% (World Bank, 2016;FAO, 2016). In Sierra Leone, fish and other seafood are the most popular sources of animal protein, with approximately 80% of the population eating it (FEWS NET, 2017). Rice is the staple food, and it is widely cultivated throughout the country, with an average annual consumption of 104 kg, one of the highest in the Saharan region (FEWS NET, 2017). The country is home to a wide range of livestock species, including chickens, ruminants, pigs, guinea fowl, rabbits, and pigeons, all of which are primarily handled on a traditional scale. More than 90% of the country's different livestock species are local breeds reared on a small-scale subsistence level under the extensive/traditional system. Accurate data on the national livestock population, various livestock breeds, and the use of modern technology to increase and enhance production are lacking. Natural pasture, kitchen waste, and other feed materials are the key sources of livestock in the country. These species are unevenly dispersed throughout the various agro-ecological zones. Livestock species serve important but underappreciated roles for millions of people in Sierra Leone. They help with food security, poverty reduction, income generation, wealth accumulation, social prestige, job creation, socio-cultural and religious functions, and crop production, especially in rural areas. Despite livestock's positive effect at both rural and national levels, production is falling short of expectations. Sierra Leone relies on imported livestock products to meet the growing demand of the population because domestic animal product consumption is reportedly low and among the lowest in the sub-region (Schneider et al., 2010). Data on livestock husbandry management practices, household, and national contributions, and production constraints are scarce. Therefore, the study's objectives were to look into the

purpose of LP at the household level, management practices, and constraints associated with LP in the Moyamba District.

MATERIALS AND METHODOLOGY

Study location and design

The study was conducted in the Moyamba District for a period of one year (January - December 2019) in five selected chiefdoms. The district is located between the capital city (Freetown) and the largest provincial headquarter town (Bo) with an estimated population of 318,588 where 92.9% of this population dwells in rural settlements (SSL, 2015). Although it is the second-lowest populated district in the southern province, it is the largest districts with fourteen chiefdoms covering a total land area of 6902 Km². Despite the anthropological multiplicity and cultural differences, the Mende tribe accounts for the largest population (60%). According to the national demographic survey published in 2015, nearly 26.8% and 9.6% of the small ruminants (SRs) population, 32.5% (chickens), 35.1% (pigs), and 25.4% (cattle) in the southern province are found in the Moyamba District (SSL, 2015). LP in the district is highly pest by frequent disease outbreaks, inadequate veterinary services, poor management practices, and limited knowledge of farmers due to the lack of technical support and the type management system adopted (free-range system) (Conteh et al. 2020a). 95.7% of the agricultural households engaged in animal husbandry practices reside in rural areas whilst 4.3% are in urban areas. Crop farming is the main source of livelihood with rice being the main staple crop although cassava, potato, banana, and yam are also seasonally and widely consumed. Ginger, oil palm, and pineapple are the main cash crops in the district. Secondary farm-bush, savannah grassland, mangrove swamps, and few patches of primary forest form the predominant mixed types of vegetation with different hydrological features. Human activities like charcoal production, crop cultivation, lumbering, urbanization, and mining have altered the natural patterns of this vegetation. The average annual minimum and maximum rainfall, relative humidity in the rainy and dry seasons, and average annual temperature are 125, 250 mm; 72, 80%; and 28°C respectively (MDCDP, 2014).

Data collection

Prior to data collection, a consultative visit was paid to key stakeholders including livestock heads and farmers in each study communities to educate them on the objectives of the study. Quantitative and qualitative data were collected in line with the set-up objectives. Quantitative data was obtained through a pre-tested questionnaire. The questionnaire consisting of 50 questions was administered to livestock farmers (LFs)

in their local languages taking into cognizance their language barrier. Face-face interview followed by door-door visit was conducted to solicit key information from the farmers. Each questionnaire consisted of three sections with both open and closed ended questions. The first section entailed the demographic attributes of the farmers, the second section gathered information on the significance of LP at household levels and flock dynamics whilst the last section collected information on the management practices and constraints affecting LP in the study area. 23 poultry, SRs, and pig farmers each were interviewed per village which sum-up to 69 farmers per village in five chiefdoms with an overall sample size of 345 participated in the study. Qualitative data were generated through observations and side comments. Desktop search through the internet similar to that described by Suluku et al. (2018) was used to obtain information from articles, journals, and monographs related to the study.

Data analysis

Data obtained were cross-examined for completeness and accuracy. All data gathered in the five chiefdoms were coded using Statistical Package for Social Scientist (SPSS) version 23.0 computer-based statistical programs. Descriptive statistic was used to analyze the data. Tables and figures were used to present findings for easy understanding and discussion of results. Observations, meaningful side comments, and interactive discussions were transcribed into narratives to add value to the study.

RESULTS AND DISCUSSION

The survey revealed that 56.5% of the respondents were men which according to the study men still take the lead in LP. The average size of the family recorded was 6.1, while Muslims made up 59.4% of the total respondents. 55.7% of the farmers had no formal education, 19.4% and 16.2% had completed secondary and tertiary education respectively, and 8.7% had Islamic education 60.0% of the farmers were between

Table 1: Demographic attributes of respondents

Variable	Valid Percent	Variable	Valid Percent
Gender		Household head	
Male	56.5	Male	91.3
Female	43.5	Female	8.7
Average family size	6.1	Marital status	
Religion		Not marry before	6.4
Islam	59.4	Married	71.9
Christianity	40.6	Single parent	21.7
Academic background		Sources of livelihood	
Lower education	19.4	Agriculture	69.3
Tertiary	16.2	Business	15.9
Islamic	8.7	Formal job	5.8
Illiterate	55.7	Others	9
Respondents' age		Main sources of income	
20-39	16.8	Crop production	26.4
40-59	60	Livestock production	54.8
60 and more	23.2	Business	4.9
		Formal job	13.9

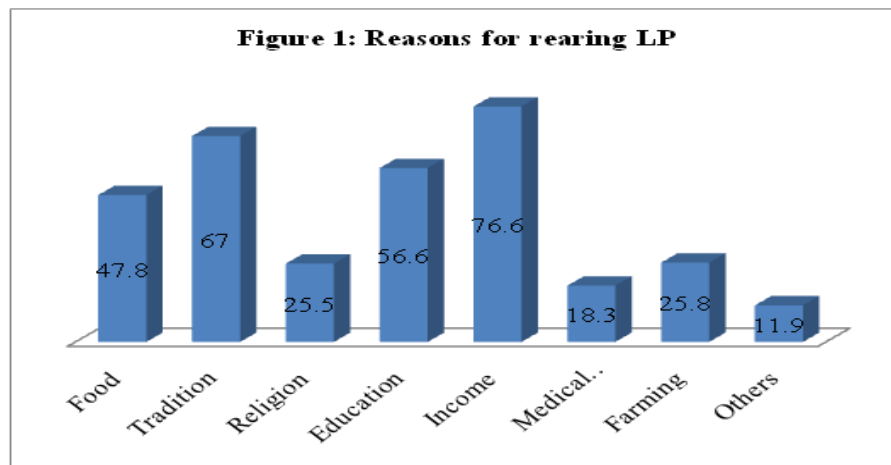
the ages of 20 and 39, 23.2% were above 60, and 16.8% were between the ages of 40 and 69. The majority of the respondents were in the active age group, full of energy to participate in livestock rearing activities. 47.0% of the respondents had 6-10 years, 30.1% had 1-5 years, and 22.9% had more than 10 years of rearing experience. 91.3% of the households were headed by men, while 8.7% were headed by women, a possible reason for the non-recognition of women participation in agricultural activities in terms of decision-making, particularly in LP. About two-thirds of those surveyed (71.9%) were married, 6.4% were

single, and 21.7% were single parents. As a result family burden shouldered by married couples such as bread winning, healthcare, education, and other needs, LP is an important tool in releasing these couples from their burden. According to the respondents' classification based on their primary sources of livelihoods, 69.3% were engaged in related agricultural activities, 15.9% in trade, 5.8% in informal jobs, and 9.0% in other careers. Different sources of income were examined, and four key paths were discovered. Nearly 54.8% of the respondents received income from livestock, 26.4% from crop production, 13.9% from

formal employment, and 4.9% from trade. This study supports the results of Herrero et al. 2012, Gizaw et al. 2010, and Suluku et al. 2018, who in their studies listed LP as one of the primary sources of income for livestock farmers. Crop production, on the other hand, was identified as the main source of income for farmers in Sierra Leone in a study conducted by FEWS NET, 2017. Livestock revenues were used to establish small businesses, pay dowries, and build and repair dwellings.

In the selected chiefdoms, LP serve an important source of income (figure 1). 76.6% of the households rated livestock as their principal source of income. Since respondents in the study area had limited access to other financial resources, livestock accounted for a substantial portion of readily available cash for household expenses. In addition, 56.6% of respondents

used LP earnings to cover educational expenses. Sierra Leone has traditionally had a strong demand for livestock. The majority of livestock farmers (67.0%) kept livestock for traditional purposes. Livestock is synonymous with cultural rituals such as secret society initiation, offerings to appease deities, title honoring, and gift to strangers. The importance of livestock species in household food security cannot be overstated. 47.8% of the respondents reported that besides bush-meat and fish the only affordable and accessible animal source of protein in their communities is livestock. Livestock provides a rich source of animal protein in the form of egg, milk, and meat, ensuring healthy growth and reducing malnutrition. Significant religious ceremonies are also fulfilled by using livestock. Sheep, especially rams, are favored by the Islamic community over other animals,



while goats are commonly used in Christian feasts. Every year, these animals are sacrificed to demonstrate faith, especially in Muslim dominated areas. LP was immensely supportive during illness. To cover the cost of healthcare service, some farmers (18.3%) sold off their animals. It was also popular to use animal manure to fertilize vegetable gardens. Other important

functions listed included family prestige, capital source to initiate business, and self-employment. Other studies conducted by Conteh et al. (2020b), Suluku et al. (2018), Bettencourt et al. (2015), and Zezza et al. (2016) within and outside Sierra Leone have also reported similar findings.

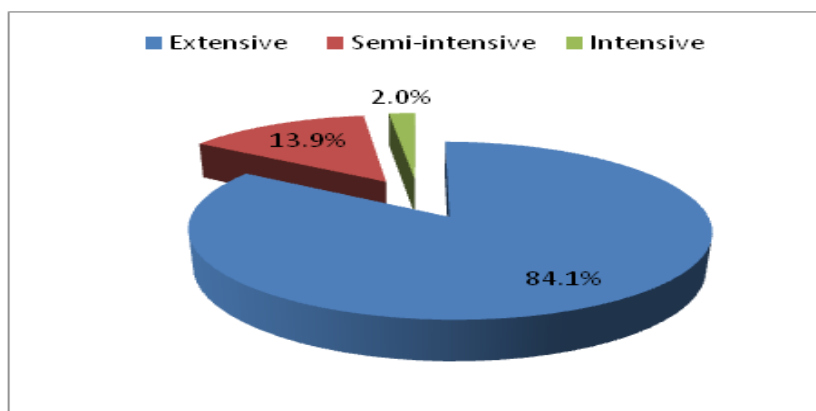


Figure 1: Management system practiced in the study area

84.1% of the respondents raised their animals under the traditional management system due to the low cost involved (figure 2). Productivity under this system was said to be below expectation as a result of poor husbandry practices, low-input, poor animal health services, feed constraints, poor market facility. Malnutrition, severe heat and sunlight, distance trekking for feed, and negative attitude towards animals further exacerbated the situation resulting into extreme losses. The free-range system had a high incidence of burglary, predator attacks, high mortality, poor growth rate, and

neighbor conflict. Due to high input requirement and knowledge gap, only 13.9% and 2.0% of the respondents adopted the semi-intensive and intensive management systems, respectively.

The result presented in table 2 showed that there was only one breed reared for each species in the study area. These single breeds (indigenous breed) were highly preferred due to their resistance against certain diseases, ability to survive under poor management conditions, thermos-tolerance, and highly productive potential as well as their high quality carcasses.

Table 2: Types of breed rear and their sources

Variables	Breed type	Frequency	Valid percent
Poultry	Local	115	100
Small ruminant	Local	115	100
Pig	Local	115	100
Sources of breeding stock			
Exchange		99	28.7
Purchase		188	54.5
Gift		59	17.1
Inheritance		47	13.6
Lend		149	43.2

However, some farmers were concerned about the lack of improved breeds in the study area because they believed improved breeds had higher fertility and growth potential. Although native breeds have long been favored over exotics, their productivity has deteriorated as a result of inbreeding and poor animal husbandry practices.

Findings on acquiring parent stock revealed that more than half of the respondents (54.5%) obtained breeding

animals by purchasing from local herders. Lending (43.2%), trading (28.7%), gifting (17.1%), and inheritance were the other ways farmers acquired their breeding stock (13.6%). These results are in line with the findings of Conteh and Sesay, (2019).

Figure 3 revealed that all respondents reared pigs, poultry, and SRs. Men reared the majority of the SRs (80.9%) and pigs (68.3%), while women reared the majority of the poultry (88.7%).

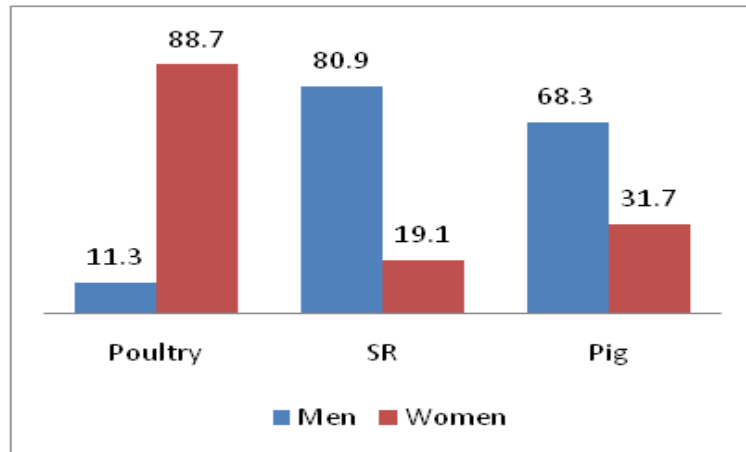


Figure 2: Livestock ownership by gender

These results are consistent with those of Conteh et al. (2020a), and Conteh and Sesay, (2019). The hard labor requirement, high income power, and the belief that large animals including pigs, goats and sheep should be reared by men were cited as justifications why men owned more animals than and women. Poultry production in the study area were mainly under the purview of women since they are easier to manage, acquire, need less space, and have a shorter generative

interval.

In Figure 3, respondents were asked to list the different species they reared. In response to this majority of the keep multiple species. 43.5% kept poultry and goats, 10.7% kept poultry and pigs while 2.3% kept SRs and pigs. The reasons highlighted for keeping more than one species were to avoid production risk such as disease outbreaks, low genetic potential, and to diversify household income.

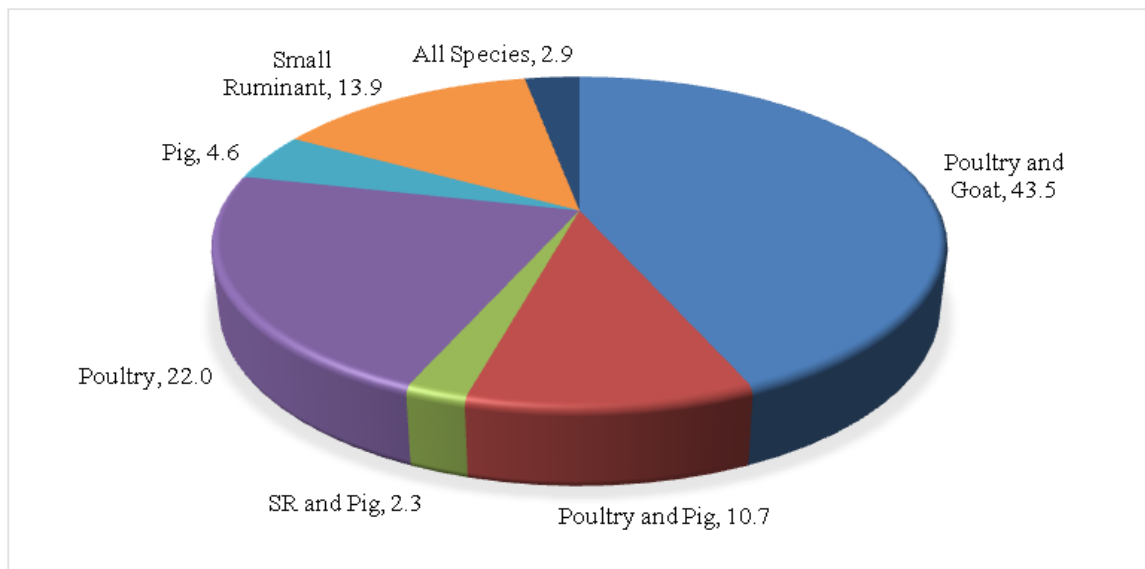


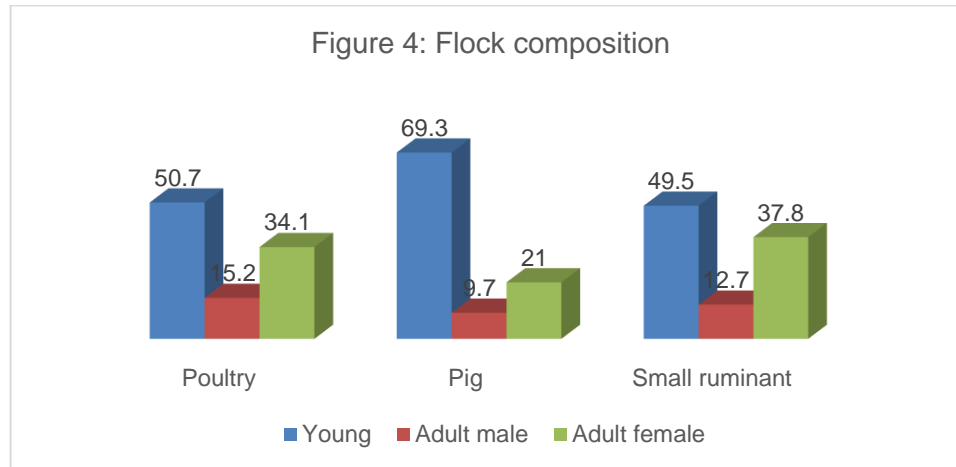
Figure 3: Number of livestock species rear by farmers

A few respondents also raised single species. For single species keepers, poultry keeper were in majority (22.0%) followed by SRs keepers (13.9%), and pig farmers (4.6%). The raising of single species was due to certain characteristics of the animals including high production

potential, morphological feature, and the objective of the farmers. In addition, 2.9% of the farmers kept all the three species. Among all species, poultry was the most widely kept species, followed by SRs, while pigs were the least common due to high feed requirements, religious taboos, and nuisance.

The results in figure 4 revealed that young animals accounted for nearly half of the flock's size. 50.7% of the poultry population were chicks, 34.1% were adult females, and 15.2% were adult males. Piglets made up 69.3% of the pigs, while adult females and males

accounted for 21.0% and 9.7%, respectively. 49.5% of the SRs were young animals, while adult females and males made up of 37.8% and 12.7% of the SR population, respectively. The flock composition was reported to be varied from season to season.



The flock number was said to be high during the dries and lower during the rains. Factors such as disease problem, poor husbandry practices, theft, predators, and demand were some of the reasons.

Adequate and quality feeding is an important management practices that helps animals to attain their productive potential and growth (Ngqulana, 2017). Table 3 shows feeding and water provision practices. Feed and water provision varied among farmers, communities as well as seasons though the practice was neglected by many. Findings showed that majority of those who practiced regular feeding were pig farmers (48.8%) followed by SR farmers (36.0%) and poultry farmers (15.5%).

The reasons for this poor feeding practice was as a result of abundant availability of local feeds such as natural pastures, trees forage, tubers, and fruits. Supplementation was not prioritized and therefore,

only a few farmers [pig farmers (23.1%), SR farmers (18.9%), and poultry farmers (8.0%)] practiced it. Kitchen wastes, peels, rice brown, palm kernel cake, maize, Garri (crushed and patched cassava), and leftovers were used as supplements, which is consistent with the findings of Conteh and Gogra (2018). Seasonal changes, farming season, farmer's lack of information on feed management and preservation, and lack of access to income farmers posed challenge on livestock feeding and supplementation (Conteh et al., 2020a). Supplementation was said to be high in the dries (52.7%) due to feed scarcity while it drops in the rainy season (35.1%), however, 17.6% of the respondents supplemented throughout the year. 62.5% of the farmers provided drinking water while 37.4% didn't. 46.5% provided water once per day while 16.1% provided water at least twice per day.

Table 3: Feeding and water management practices observed in the study areas

Variables	Valid %	Variables	Valid %
Feed provision		Water provision	
Poultry	15.1	Yes	62.6
Small ruminant	36.0	No	37.4
Pig	48.8	Frequency	
Supplementation		Once a day	46.5
Poultry	8.0	More than once	16.1
Small ruminant	18.9	Season with high water provision	
Pig	23.1	Dry season	61.4
Supplementation season		Raining season	8.7
Dry season	52.7	Throughout the year	29.9
Raining season	35.1	Type of water	
Both seasons	17.6	Running/well	51.9
		Hand pump/tap	48.1

61.4% of the farmers supplied water to their animals in the dry season, 29.9% said they always give water to their animals, while only 8.7% provided water during the rainy season. The lack of frequent water supply among farmers was due to the lack of knowledge about the importance of water to LP, accessibility, and farmers' daily engagement. Studies have reported that adequate and good drinking water contributes up to 50-80% of an animal's body weight and has a major physiological role in blood composition, growth efficiency, organ functioning, body temperature control, nutrient digestion and absorption, waste removal, and joint and bone lubrication (Peden et al. 2005; Parker and Brown,

2003). 51.9% of the farmers accessed water from borehole, river, stream, or swamp, compared to 48.9% who used a hand-pump or tap.

Due to lack of supplied water, animals are forced to drink from gutters, protected water containers, and other sources.

In table 4, 81.4% of farmers provided permanent shelters for their animals, 28.1% had no specified structure to confine their animals, and 18.6% had no shelter, which is consistent with Mohamed et al. (2016) study.

The majority of the shelters provided during the study were constructed with locally available materials.

Table 4: Housing and its management practices

Variables	Valid %	Variables	Valid %
Type of housing		Reason for building housing	
Permanent house	53.3	Protection	67.2
No separate house	28.1	Easy access	21.3
No housing	18.6	Record taking	7.4
Reasons for lack of housing		Resting	4.1
Theft	51.3	Cleaning schedule	
Small flock size	8.7	Daily	29.0
Cost and lack of labor	25.5	Twice/Week	48.7
Lack of space	4.9	If untidy	15.9
Predator	9.6	Did not clean	6.4

Animal theft (51.3%), the cost of building and hiring labor (25.5%), predation (9.6%), small flock size (8.7%), and lack of space (4.9%) were reasons why some farmers did not provide shelters for their animals. Due to the lack of housing, animals were housed in kitchens, stores, and dwelling houses. Unhoused animals do stay at night in abandoned buildings, ceilings, and verandas. Majority of the shelters provided were characterized by poor ventilation, floor, and roofing conditions thus compromising the health of the animals. In addition, shelters were overcrowded and sometimes housed more than one species which may have resulted in disease transmission among species. Practice like cleaning was hardly done by some farmers. The majority of the farmers (48.7%) cleaned their shelters at least twice per week, 29.0% cleaned on daily basis, 15.9% when the need arises while 6.4% did not practice any form of cleaning which is consistent with the report of Conteh and Gogra, (2019).

Different diseases identified in the study area are presented in figure 6. Based on farmers' clinical description and observation, skin infection was the most common disease evidenced in the study area, particularly among pig farmers (39.0%), followed by anemia, worms, and diarrhea. Infections of the respiratory tract and ear as well as paraphimosis were also listed. These results are consistent with the findings reported by Conteh and Gogra, (2019); Ironkwe and Amefule, (2008). Peste des petits ruminants, skin diseases, diarrhea, and parasites were the most prevalent diseases reported by small ruminant farmers. Respiratory infection, foot rot, bloat, paraphimosis, and lymphadenitis were also identified among SR farmers. The findings are in support of those of Conteh et al. (2020c); Suluku et al. (2018), who reported similar diseases. Newcastle disease was the main restriction to local poultry production, according to 36.0% of the respondents.

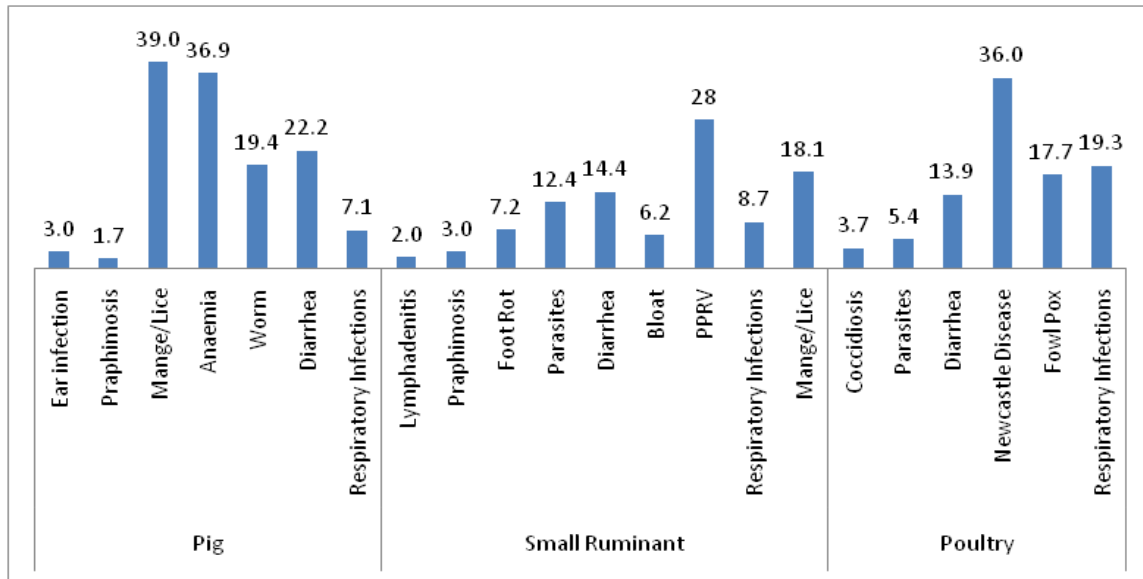


Figure 4: Diseases of livestock in the study area

The most common diseases of economic interest reported were Newcastle, respiratory infection, fowl pox, diarrhea, parasites, and coccidiosis which supports findings made by Conteh and Sesay, 2019; Conteh et al. 2020d. The persistent occurrence and spread of diseases in the study areawere due to a lack of awareness among livestock keepers, limited/no modern treatment services, and poor livestock extension services.97.1% of the farmers reported that in the past their herd have been affected by many preventable diseases. Although diseases affected all both young and adult animals (24.1%), 55.7% of the respondents said young animals were the most vulnerable, while 20.2% said adult animals were the most vulnerable.

The lack of adequate healthcare services, inadequate adherence to biosecurity steps, low immunity (young animals), shortage of feed and water, and continued exposure of animals to the free-range environment were all factors responsible for their vulnerability.

Furthermore, the prevalence of disease was closely linked to seasonal changes. Disease prevalence was

said to be high in the rainy season and winter period due to favorable climatic conditions for disease organisms, though parasite incidence was said to be low, and the opposite was true in the dry season. Direct interaction with infected animals (59.1%) and sharing of drinking and feeding sources (30.1%) were the most common modes for disease transmission. Other means of transmission were unsupervised animal movement, improper disposal of infected carcasses, and poor biosecurity adherence of animal health professionals moving from one point to another.

Table 5 shows the various methods farmers respond to disease outbreaks. When farmers notice disease outbreak in their herd, the majority of the farmers (63.2%) offer self-treatment, 32.2% either eat or sell, 23.2% report to community animal health workers, 7.0% relocate their animals, and 13.3% said they offer no solution. Despite a few farmers have knowledge on modern animal services in the district, affordability and accessibility were majorchallenge. This led to 65.5% of the respondents using ethno-medicine to treat sick

Table 5: Disease conditions and management strategy in the study areas

Variable	Valid %	Variable	Valid %
Farmers who have been affected by diseases	97.1	Mode of transmission	
Animals most at risk		Direct contact	59.1
Young	55.7	Share feeding/drinking source or containers	30.1
Adult	20.2	Unsupervised movement	5.9
Both young and adult	24.1	Wrong carcass disposal	2.9
Outbreak response mechanism		Treatment services	2.0
Report	23.2	Treatment methods	
Self-treatment	63.2	Conventional	22.9
Sell or eat	32.2	Traditional	65.5
Relocate animals	7.0	Both	11.6
Nothing	13.3		

Animals. Some farmers (22.9%) also reported that they used veterinary drugs while 11.6% used both ethno and veterinary medicines during outbreaks.

Marketing of livestock and their products and challenges associated with it in the study area assessed and the results of the assessment are presented in table 6. Although livestock keeping was not meant purposely for commercial purpose, 75.9% of the farmers agreed to sometimes sell their animals. These animals were sold when the farmer needed instant cash (67.2%), at the start of school year (37.4%), when outbreak occurs (26.1%), to provide food at home (21.2%), to control flock size (10.1%), and to support crop production and business activities (13.5%). These results support the findings of Conteh et al., 2020a;

Tekle et al., 2018; Ahmad, 2013. Livestock farmers have a wide range of customer connection. Middlemen, religious followers, local herders, NGOs, and eatery runners form a strong customer link with the farmers. The only livestock market reported of was the informal type characterized by self-price regulation, numerous selling points, and no standard weighing. 44.3% of the respondents sold their animals in festive seasons, 29.6% in the dry season, 16.9% when the need arise, and 9.2% in the rainy season.

Periodic marketing was the biggest challenge reported by 41.7% of the farmers. Price fluctuation was also considered a major challenge. Demand in the festive season increases leading to better price and more sales.

Table 6: Livestock marketing and its challenges

Variable	Valid %	Variable	Valid %
Sometime sell animals	75.9	Buyers/customers	
Reasons for selling		Local producers	19.1
Need immediate cash	67.2	NGOs	17.7
Disease outbreaks	26.1	Consumers	35.4
Educational purpose	37.4	Religious groups	27.5
Maintain flock size	10.1	Middlemen	57.7
Others	13.5	Eatery runners	11.0
Food	21.2	Spiritualists or herbalists	15.1
Market season		Market challenges	
Dry season	29.6	Periodic marketing	41.7
Raining season	9.2	No established market	8.3
Festive season	44.3	Lack of information	20.8
As need arises	16.9	Seasonal price	29.2

Lack of access to correct market information and centers and lack of a well-structured market for livestock and their products were further challenges.

Despite keeping livestock extends beyond being male or female, decision making are most times done by men. 91.3%, 83.1%, and 60.6 % of the respondents who kept SRs, pigs, and poultry, respectively agreed that key decision on livestock management practices (especially on economic related issues) at household level men were mainly taken by men (table 7).

Decision on income from sales of livestock, permission to administer treatment, deciding which animal to sell or to eat were taken by men. However, at few households

women [poultry farmers (39.4 %), pig farmers (16.9%), and SRFs (8.6%)] also participated in decision making. Household contributes a significant labor force in the day-to-day management of livestock at varying degree. Men did a larger proportion of the tasks including shelters construction (70.0 %) and selling (60.7 %), especially SR and pigs.

Women contributed the highest labor force to tasks like caring for lactating animals (79.3%) and feeding (51.4 %). Children also performed key tasks such as cleaning animals (96.5%), pens (74.3%), provision of water (66.4%), confining animals (54.1%), and keeping record of animals (40.1%).

Table 7: Decision making and labor contribution

Livestock Decision-makers	SRFs	Poultry farmers	Pig farmers
Men	91.4	60.6	83.1
Women	8.6	39.4	16.9
Management responsibility	Men	Women	Children
Shelter construction	70	5	25
Feeding animal	15.4	51.4	33.2
Provision of water	20.6	11	66.4
Cleaning of pen	6.3	19.4	74.3
Confining animals	12	23.9	54.1
Cleaning animals	3.5	0.00	96.5
Caring for young animals	10	79.3	10.7
Selling animals	60.7	39.3	0.00
Keep record of animals	28.5	31.4	40.1

These findings are in support of Njuki and Sanginga, (2013); Shafiq, (2008); Banuree (2019); Tangka et al. (2000); Ahmad, (2013) findings outside Sierra Leone. Major challenges spanning from technical, non-technical, and environmental serve as bottleneck to livestock production in the study area. These challenges differ in degree among farmers and communities as shown in figure 6. In order of priority,

feed, inadequate treatment services, parasitic infestation, disease occurrence, neighbor conflict, lack of support, high mortality, and inferior breed quality were the main challenges faced by pig farmers (figure 7). SR production suffers major challenges such as disease, poor animal healthcare, theft, neighbor conflict, high mortality, shortage of feed, and poor water provision in decreasing order of importance.

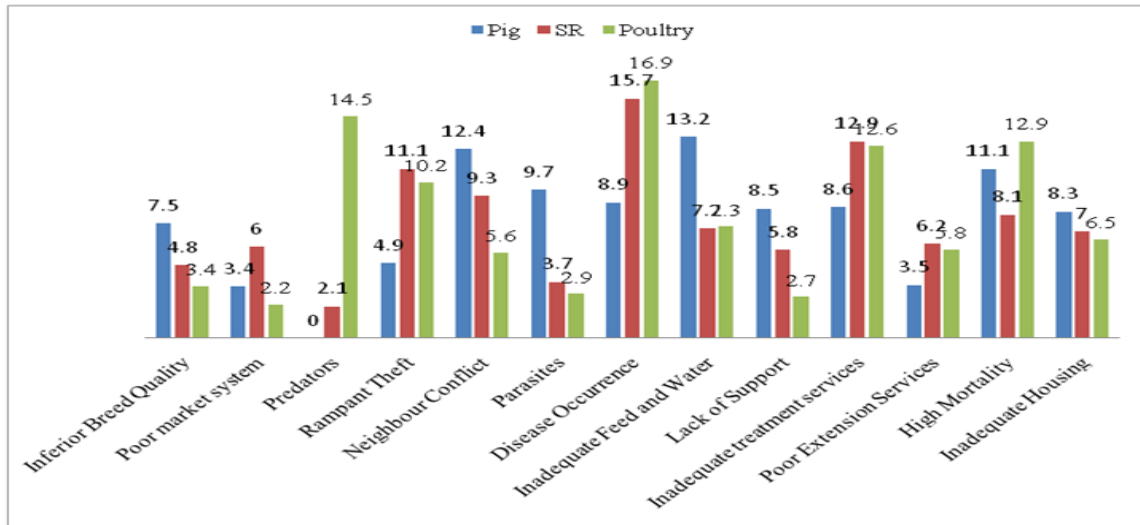


Figure 5: Challenges faced by livestock farmers

Disease infestation, predation, high mortality, poor treatment services, and theft were the major impediment fueling low productivity of poultry among others. Previous surveys conducted by Conteh and Gogra (2019); Conteh and Sesay (2019); Conteh et al. (2020e) in Sierra Leone and in other countries (Ngqulana, 2017; Mutibvu et al., 2012; Gebeyehu et al. 2013; Tibbo, 2006; Mahoro et al., 2017) also reported similar challenges.

CONCLUSION AND RECOMMENDATIONS

The result of the survey led to the unveiling of the contribution of livestock at household level by promoting food security, economic development, social lifestyles, and educational activities. Traditional system of keeping livestock using indigenous breeds still prevails. Husbandry practices like proper feeding and providing adequate water, disease management, and proper housing were poorly practiced. Children contributed more to the day-to-day management of livestock compared to women and men. Livestock production is faced with many challenges including diseases outbreak, poor veterinary service, high mortality, theft, predation, poor housing and feeding, neighbor conflict,

poor extension services, and inferior breed quality, leading to low productivity and growth. For the livestock industry to prosper, multi disciplinary methods must be adopted by relevance stakeholders to mitigate challenges hampering LP. This will involve training more livestock extension workers who in turn train and advice farmers on good husbandry practices like biosecurity, adequate feeding, joint decision, and proper housing through demonstration and participation. The problems of livestock production are cumbersome, therefore, understanding them may help to strategize a holistic approach.

REFERENCE

- Ahmad TI (2013). The role of rural women in livestock management: socio-economic evidence from diverse geographical locations of Punjab (Pakistan). Geography. Université Toulouse le Mirail – Toulouse II. English. NNT: 2013TOU20067.tel-00933784.
- Ahmed M (2018). Major constraints and health management of village poultry production in Ethiopia: Review school of veterinary Medicine, Jimma University, Jimma, Ethiopia. Internal Journal of Research Studies in Microbiology and Biotechnology:

- 4(1):1-10. www.arcjournals.org.
- Banuree SAH (2019). Women participation in livestock activities in Nangarhar province. *International Journal of Multidisciplinary Research and Development*: 6(2):125-128. www.allsubjectjournal.com.
- Bettencourt EMV, Tilman M, Narciso V, Carvalho MLS, Sousa HPD (2015). The livestock role in the wellbeing of rural communities of Timor-Leste. *Revista de Economia e Sociologia Rural*: 53(1):63-80. <https://doi.org/10.1590/1234-56781806-94790053s01005>.
- Brears RC (2017). *Urban water security*. Chichester: Wiley.
- Conteh AM, Gogra AB (2019). Indigenous pig farming in rural areas of Sierra Leone: practices, constraints and impact on livelihood. *Journal of Animal Science and Veterinary Medicine*: 4(4).
- Conteh AM, Kallon MN, Jojo DH, Sesay AR, Bundu WT (2020b). Survey on small ruminant production against Peste des Petits Ruminant in Moyamba and Kailahun Districts, Sierra Leone. *International Journal of Research-Granthaalayah*: 8(2):2350-0530.
- Conteh AM, Kallon S, Moiforay SK, Sesay AR (2020e). Knowledge, attitudes, and practices of goats and sheep farmers towards mange disease and control measures. A rural survey in Moyamba District, Southern Sierra Leone. *Middle East Journal of Applied Science & Technology*: 3(1):63-74.
- Conteh AM, Moiforay SK, Sesay AR, Kallon S (2020c). Knowledge, attitudes and practices of goats and sheep farmers towards mange disease and control measures. A rural survey in Moyamba District, Southern Sierra Leone. *Middle East Journal of Applied Science & Technology*, 3(1), 63-74.
- Conteh AM, Moiforay SK, Sesay ME, Kallon S (2020d). Prevalence of Newcastle disease virus in apparently health chickens in Sierra Leone. *Animal and Veterinary Services*: 8(5):99-103. Doi: 10.11648/j.av.s.20200805.12.
- Conteh AM, Sesay AR (2019). Current status of indigenous chicken production in Moyamba District, Sierra Leone. *Internal Journal of Research Studies in Microbiology and Biotechnology*: 4(1):1-10.
- Conteh AM, Sesay ME, Sheriff F, Sesay MMM (2020a). Small Ruminant Production: Contributions, Management Practices and Challenges at Traditional Level in Rural Areas of Sierra Leone. *American Journal of Zoology*: 3(3):57-64. Doi: 10.11648/j.ajz.20200303.12.
- Emebet D, Awoke K, Asenakew A (2017). Challenges, opportunities and management practice of pig production in Debre Markos Town, East Gojjam Zone In Amhara Regional State, Ethiopia. *Poult Fish WildlSci*: 5(176). Doi: 10.4172/2375-446X.1000176.
- Famine Early Warning System Network (FEWS NET), (2017). *Sierra Leone Stable Food Market Fundamental*. www.fews.net.
- Gebeyehu A, Hundessa F, Umata G, Muleta M, Debele G (2013). Assessment on challenges and opportunities of goat farming system in Adami Tulu, Arsi Negelle and Fantale districts of Oromia Regional State, Ethiopia. *African Journal of Agricultural Research*: 8(1):26-31. <http://www.academicjournals.org/AJAR>.
- Gizaw S, Tegegne A, Gebremedhin B, Hoekstra D (2010). Sheep and goat production and marketing systems in Ethiopia: Characteristics and strategies for improvement. IPMS (Improving Productivity and Market Success) of Ethiopian Project Working Paper 23. ILRI, Nairobi, Kenya. 58 pp.
- Herrero M, Grace D, Njuki J, Johnson N, Enahoro D, Silvestri S, Rufino MC (2012). The roles of livestock in developing countries. *Animal*, null 1-16. DOI: 10.1017/S1751731112001954
- ILRI (2002). *Mapping poverty and livestock in the developing world*. ILRI, Nairobi, Kenya.
- Ironkwe MO, Amefule KU (2008). Appraisal for indigenous pig production and management practices in Rivers State, Nigeria. *Journal of Agriculture and Social Research*: 8(1).
- Mahoro J, Muasya TK, Mbuza F, Habimana R, Kahi AK (2017). Characterization of indigenous chicken production systems in Rwanda. *Poultry Science*: 96(12):4245-4252 <http://dx.doi.org/10.3382/ps/pex240>.
- Mohamed A, Hailemariam S, Gebremedhin G, Gebeyew K (2016). Challenges and opportunities of small-scale poultry production system in Jijjiga Zone, Somali Regional State, Ethiopia. *Journal of Poultry, Fisheries & Wildlife Sciences*: 4(1): ISSN: 2375-446X PFW. DOI: 10.4172/2375-446X.1000144.
- Molina-Flores B, Manzano-Baena P, Coulibaly MD (2020). The role of livestock in food security, poverty reduction and wealth creation in West Africa. *FAO*, <https://doi.org/10.4060/ca8385en>.
- Molina-Flores B, Manzona-Baena P, Coulibaly MD (2020). The role of livestock in food security, poverty reduction and wealth creation in West Africa. *FAO*, <https://doi.org/10.4060/ca8385en>.
- Mutibvu T, Maburutse BE, Mbiriri DT, Kashangura MT (2012). Constraints and opportunities for increased livestock production in communal areas: A case study of Simbe, Zimbabwe. *Livestock Research for Rural Development*: 24, 165. <http://www.lrrd.org/lrrd24/9/muti24165.htm>.
- Ngqulana TC (2017). Constraints and opportunities in communal livestock production development in Nyandeni Local Municipality, Eastern Cape Province, South Africa. *MScAgric (Extension)*. Department of Agricultural Economics, Extension and Rural Development, University of Pretoria, Pretoria.
- Ngqulana TC (2017). Constraints and opportunities in communal livestock production development in Nyandeni Local Municipality, Eastern Cape Province, South Africa. *M.Sc. Thesis, Agricultural Extension*, (12102832), University of Pretoria, Pretoria.
- Njuki J, Sanginga PC (2013). *Women, livestock ownership and markets*. New York, USA: Earthscan

- USA/International Development Research Centre, Canada.
- Otte J, Pica-Ciamarra U, Morzaria S (2019). A comparative overview of the livestock environment interactions in Asia and Sub-Sahara Africa. *Front. Vet. Sci.*: 6(37): Doi:10.3389/fvets.2019.00037.
- Otte J, Upton M (2005), poverty and livestock agriculture. In A. Rosati, A. tewolde, & C, Mosconi (Eds.), *Animal Production and Animal Science Worldwide*, 281-296. The Netherlands: Wageningen Academic Publisher.
- Parker DB, Brown MS (2003). water consumption for livestock and poultry production. *Encyclopedia of Water Science West Texas A&M University, Canyon, Texas, U.S.A.* Doi: 10.1081/E-EWS 120010303.
- Peden D, Tadesse G, Mammo M (2005). Improving the water productivity of livestock: an opportunity for poverty reduction, ILRI, Addis Ababa, Ethiopia.
- Popp A, Lotze-Campen H, Bodirsky B (2010). Food consumption, diet shifts and associated non-CO2 greenhouse gasses from agricultural production. *Global Environmental Change*, 20:451.
- Rosegrant MW, Fernandez M, Sinha A, Alder J, Ahammad H, de Fraiture C, Eickhout B, Fonseca J, Huang J, Koyama O (2009). Looking into the future for agriculture and AKST (agricultural Knowledge Science and Technology). In: McIntyre, B.D., Herren, H.R., Wakhungu, J. & Watson, R.T. *Agriculture at crossroads*. Island Press, Washington D.C., USA.
- Schneider K, Gugerty MK, Plotnick R, Anderson CL (2010). Poultry market in West Africa: Overview and comparative analysis.
- Senahoun J, Gunjal K, Mwanundu R, Sandstrom S, Giuffrida V (2014). *FAO/WFP crop and food security assessment – Sierra Leone*.
- Shafiq M (2008). Analysis of the role of women in livestock production in Balochistan, Pakistan. *Journal of Agriculture and Social Sciences*: 4(1):12-22. <http://www.fspublishers.org>.
- Suluk R, Macavoray A, Moiwo PJ, Koroma BM (2018). Effect of PPR disease on socio-economic characteristics of farmers in Moyamba District, Sierra Leone. *Agricultural Science Research Journal*: 8(7):149-158.
- Tangka FK, Jabbar MA, Shapiro BI (2000). Gender roles and child nutrition in livestock production systems in developing countries: A critical review. *Socioeconomics and policy Research Working Paper 27*. ILRI (International Livestock Research Institute), Nairobi, Kenya. 64 pp.
- TekleY, Ftiwi M, Tassew A (2018). Small ruminant production and constraints in Lanfuro Woreda, Southern Ethiopia. *Journal of Zoological Sciences*: 6(1):p-ISSN:2347-2294
- Thornton PK, Jones PG, Owiyo T, Kruska RL, Herrero M, Kristjanson P, Notenbaert A, Bekele N, Omolo A, Orindi V, Ochieng A, Otiende B, Bhadwal K, Anastram S, Kumar V, Kelkar U (2006). Mapping climate vulnerability and poverty in Africa. Report to the Department for International Development. ILRI, Nairobi, Kenya. www.dfid.gov.uk/research/mappingclimate.pdf.
- Thornton, PK (2010). Livestock production: recent trends, future prospects. *Philos. Trans R Soc Lond B Biol Sci*: 365(1554):2853-2867. DOI: 10.1098/rstb.2010.0134.
- Tibbo M (2006). Productivity and health of indigenous sheep breeds and cross breeds in the Central Ethiopian Highlands. PhD. Thesis, Swedish University of Agricultural Science, Uppsala. ISSN: 1652-6880.
- World Bank (2009). *Minding the stock: bringing public policy to bear on livestock policy*. World Bank, Washington D.C., USA.
- World Bank (2016). *World development indicators, Sierra Leone*. World Bank. http://data.worldbank.org/country/sierraleone#cp_wdi.
- Zeza A, Pica-Ciamara U, Mugeru HK, Mwisomba T, Okello P (2016). *Measuring the role of livestock in the household economy. A guide book for designing household survey questionnaires*. Washington DC: World Bank.