Socio-economic constraints affecting performance of traditional sheep systems of Tanzania: A case of Mpwapwa and Longido districts, Tanzania

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Abstract- The main objective of this study was to examine the performance of sheep livestock sub sector under pastoral and agro-pastoral schemes in the Tanzanian farming systems. Specifically the study was conducted at Mpwapwa and Longido districts in the Central and Northern farming systems of Tanzania respectively, to gather socio-economic factors affecting sheep production and productivity in Tanzania. PRA was employed to understand the socio-economic set up of the communities involved in the sheep sub sector.

Results show that majority (91.30%) of households at Mpwapwa district are male headed as compared to (8.70%) female headed households, while at Longido majority are also male headed households (77.50%) and only 22.50% are female headed households. Most farmers are elite and they can comprehend sheep technologies as about 90% of the respondents could read and write. Farmers depend mainly on agriculture and livestock for their livelihood as about 60% of the households at Mpwapwa and 53% of the household at Longido practice both crops and livestock production. They also practice some off-farm activities like petty business at a level of 18 and 22% for Mpwapwa and Longido respectively. Almost all farmers admitted that sheep provides regular cash income and an insurance against emergencies, therefore sheep were important resource for their livelihoods. Sheep sub sector faces major constraints like inadequate access to improved grazing in terms of carrying capacity (CC). There is lack of capacity in planning land resource use and inadequate knowledge on supplementary feeding. Sheep husbandry like housing, vaccinations and disease control are also inadequate. There no proper marketing infrastructure of both sheep and products. Involvement of women in sheep welfare is high to a tune of 56.25% in comparison to only 25% of men involvement, whereas the knowledge and innovations of sheep production is centered more to men (61.25%) than women (23.75%) of households. Policies are not that much effective in promoting sheep sub sector.

It is concluded that improvement of sheep sub sector could be effected through full involvement of all stakeholders. Both research and extension systems need to be supported fully by government to improve sheep farmers' production systems.

Index Terms- Pastoral, agro-pastoral, sheep sub sector, Constraints, Tanzania

I. Introduction

Sheep as members of small ruminants in Sub Saharan Africa (SSA) has a unique niche in smallholder agriculture due to the fact that they require small investments; have shorter generation interval, higher growth rates and they are more adaptable to most semi-arid and other harsh environmental climates as compared to large ruminants. (Tibbo *et al.*, 2006). In Tanzania sheep are kept for both tangible (i.e., cash income from sales of animals and meat but also for home consumption) and intangible benefits e.g. savings, an insurance against emergencies, cultural and ceremonial purposes (Njombe *et al.*, 2008; Kosgey *et al.*, 2006). Kosgey *et al.* (2006) ranked regular cash income as the most important purpose for raising sheep for both smallholders and pastoral/ extensive farmers. It has been noted that sheep in smallholder agriculture have greater environmental adaptability as compared to larger ruminants. They are seen as important among livestock in Tanzania as it is projected that by 2020, Tanzania and other African countries would export only mutton and goat meat while they will import most of her beef; milk and pig meat (Geerlings *et al.*, 2002; FAO, 2002b).

Given these advantages, it is not surprising that sheep are found in many smallholder systems of Tanzania. Population growth rates have, however, been very low at about 1.2% per annum in most Sub Saharan Africa (World Bank, 2011). World Bank livestock project reports have shown that sheep enterprises have generally produced less than 10% rates of return on investment, which is low compared to crop production. Although some analyses (Upton, 1984) show high rates of return from sheep (55%), this may not be realistic as the analyses have not considered the opportunity costs of labour and land (ICAR/FAO, 2000). However, it has been reported by ICAR/FAO (2000) that inadequate and poor quality feed resources (especially during the dry season) in some parts of Sub Saharan Africa (SSA) has been the most serious constraint to sheep production under the nomadic and sedentary systems. Small ruminant systems in developing countries like Tanzania are changing rapidly in response to a variety of drivers. With the encroachment of cropping in the grazing areas and disappearance of dry season grazing reserves, sheep production has become very dependent on the availability of crop residues and by-products and purchased feed especially during mating and early pregnancy. In most countries it has become necessary to all producers (large or

smallholder) to access supplemental feeds (barley, wheat bran, straws and other crop residues) or else have to abandon sheep production.

It has been internationally reported that livestock systems in developing countries are changing rapidly in response to a variety of drivers. This is because globally, human population is expected to increase from the current population of about 6.5 billion to 9.2 billion by 2050 (Thornton *et al.,* 2009). Furthermore it has been specified that more than 1 billion of this population increase will occur in Africa because of the current rapid urbanisation which is also expected to continue in most of the developing countries. This obvious could be the cause of the increase of the global demand for livestock products to feed and sustain such a population (Delgado *et al.*, 1999).

The current livestock sector production in Tanzania has not been able to meet the demands of meat markets both internally and externally (MLD, 2002). Although livestock sub-sector provides about 30 per cent of the agricultural Gross Domestic Product (GDP), the larger share of this, 40 percent originates from beef cattle which is followed by milk, then the last is small ruminants (sheep and goats) which provides the smallest portion (URT, 2015a

It has been specified that in comparison with their counterparts (Cattle and goats), sheep has been lagging behind because cattle and goats have shown a dramatic increase in population and productivity despite their comparable higher off-take rate of 14% and 28% respectively. Literature has shown that the off-take rate of sheep is still lagging at 8% (Njombe *et al.*, 2008).This slow increase of sheep population despite of their low off-take has had no clear and convincing explanation from livestock stakeholders. There is no any study which exactly elucidates the cause of such slow increase and low performance of Tanzanian national flock of sheep despite of the specified low off-take. This study was therefore aimed at conducting a detailed analysis on the performance of sheep in the farming systems of Tanzania, by scrutinizing factors associated with sheep and to identify the real socio-economic constraints and opportunities for sheep production and reproduction status in Tanzania, which could generate some suggestions on ways of addressing them and enhance utilization of the identified opportunities.

II. 2.1 Statement of the Problem

Tanzania in collaboration with her development partners has set the vision 2025 for addressing her Millennium Development Goals (MDGs) which seeks to achieve a sustained economic annual growth rate of at least 8% or above. Nonetheless this will require an acceleration in rural economic opportunities of both farm and nonfarm management of the entire Tanzania's rich natural resource bases. One of the neglected potential resource bases is the traditional national sheep flock within livestock sub-sector. The resource base has potential due to the fact that FAO (2002a) and Geerlings *et al.* (2002)researches have analysed and projected that by 2020 Tanzania and other African countries could have an opportunity to export more mutton and contribute to food production for the world population. However currently Tanzania sheep sub sector is still performing lower than required (Njombe *et al.*, 2008).This is because sheep sub sector indices in terms of sheep production and productivity are low. However there is no clear and convincing explanation of such status from livestock stakeholders. Nonetheless there have been very few researches dwelling on sheep development in the country (MLD, 2006). With such background, resource base like sheep should be given impetus in development (on issues of research, production and marketing). This study was therefore aimed at conducting a detailed study on the performance of sheep in the farming systems of Tanzania and trying to identify socio-economic constraints but also identifying opportunities for such underutilized livestock sub-sector.

2.2 Objectives

The main objective of this study was to examine the performance of sheep livestock sub sector under pastoral and agro-pastoral systems in the Tanzanian farming systems.

Specifically the study was conducted at Mpwapwa and Longido districts in the Central and Northern farming systems of Tanzania respectively, to gather socio-economic factors affecting sheep production and productivity in Tanzania.

III. Research Elaborations

3.1 Literature review

The motive behind this study was the human population which is expected to increase from the current about 7 billion to around 9.2 billion by 2050, which is a benchmark of paramount importance for economic planning (Thornton *et al.,* 2009).The concern here is the fact that the increase of more than 2 billion people will impose a big need of food in form of protein, carbohydrates, vitamins and minerals to sustain their life, of course with the required internationally accepted set nutritional standards, but also Tanzania is focusing to addressing set Millennium Development Goals (MDGs) where the abject poverty have to be addressed accordingly by improving the income of rural poor farmers through all possible and feasible farm enterprises. This makes it necessary to expand almost all possible food production channels of which sheep as one of the target sub-sector must be expanded in terms of optimum population achievement, production and respective productivityof sheep products (URT, 2015). When focusing on sheep as one of the food channels within livestock sector in Tanzania it is seen as being lagging behind, and so this study is trying to gather scientific information and facts on why the sub sector is still that much low.

Considering the projected human population growth, the outputs of livestock products have to increase substantially in the coming decades. The projected annual growth rates for the population by UNFPA (2005) in East Africa sub-region is 2.55 percent for the period up to 2020, while the expected growth rate for livestock numbers is only 1.41 percent per year. It is thought that with the 2 billion people expected to increase by 2050, about 1 billion of this increase will occur in Africa (UNFPA, 2005). This is because rapid urbanization is expected to continue in developing countries, and the global demand for livestock products will continue to increase significantly in the coming decades.This suggests that expansion of the livestock population like sheep and their productivity is insufficient to keep pace with human population growth, and therefore increases in animal production and productivity are necessary (FAO, 2002 a).

Poverty is one of the main causes of starvation in the developing world (FAO, 2002b). Currently, 25% of people in developing countries are living on less than 1.25US $ a day (The World Bank, 2011). It is said that this proportion is slowly declining while the population growth, together with global energy and food crisis, affects socio-economic development. Consequently in Sub-Saharan Africa (SSA) the number of the poor has increased (FAO, 2002b) and if such a situation is not tackled it is likely to continue. The current situation concerning poverty and hunger in SSA necessitates a demand for livestock products to increase and needs to be more than doubled by 2030 (FAO, 2007). Such profound increase in demand of livestock products, referred to as the "Livestock Revolution", can partly be explained by the population growth but also the improved incomes for groups of people in developing countries (Delgado *et al*., 1999). The growth of agricultural sector especially livestock sub sector in this case has therefore a crucial role to play in improving the livelihood and income of poor people (FAO, 2002b)

Achievements of the broad set of MDGs will require an acceleration of growth and greater equality in growth and service delivery for the Tanzanian community. Meeting the specific MDGs of halving poverty and food insecurity by 2020 especially in the Tanzanian rural areas will require annual Gross Domestic Product (GDP) growth of at least 8 percent or more. In addition, this will require further acceleration in rural economic opportunities both farm and non-farm management of Tanzania's rich natural resource base (MPEE, 2006). The vision 2025 envisioned achieving a sustained annual growth rate of 8 or above percent, halving abject poverty by 2020 and eliminating it by 2025. One of Tanzania's strategies is to increase growth rate of the livestock sub-sector from 2.7% in 2015 to 10% or above in 2025. However, for a number of decades, the number of sheep being one of the resource bases in Tanzania has been lagging at about 8.7 million (URT, 2015) while that of their counterparts goats and cattle have shown dramatic increase despite their high off-take rate of 28% and 14% respectively when compared to only 8% off-take of sheep. It has been reported by URT (2015) recently that 86% of the rural livestock farmers are poor, only 26% adopt improved breeding strategies. Furthermore only 38% vaccinate and treat their animals against diseases and only 20% utilize innovations from the extension system. Such situation need to be scrutinized to understand the real cause to such effect.So, some of the factors narrated here could be the possible causes of the current sheep population performance (URT, 2006; FAO, 2006; Shirima and Valentino, 2014), For instance many of these indigenous breeds in SSA Tanzania included, are unfortunately underutilized and even threatened by extinction. The most promising ways to maintain the threatened breeds would be to improve their genetic potentials and make them commercially competitive (FAO, 2006). In the current situation most of these animals are raised in the major pastoral and agro-pastoral livestock keeping areas of Tanzania. However, most pastoralists and agro-pastoralists who own the largest population of sheep are still not performing well due to the fact that they succumb in an inadequate environmental conditions which is normally caused by a low socio-economic status prevailing in these communities (IIED, 2010). The lack of improvement programmes to increase the productivity of such indigenous livestock is due to scarce information on their baseline production traits in different environments and also their genetic potential under improved production environment. However, low preference for mutton in the country could be another issue (Bett *et al.*, 2012).

Sheep production depends on various factors namely: climate, diseases/parasites and nutrition (Thornton, 2010). Climate factor is the master and interface to the diseases as well as parasites and nutrition factors. This is due to the fact that differences in effects caused by variation in factors in different type of climate could lead to diverse in prevalence of disease causative agents' and parasites'. This is because different diseases causative agent and parasites have different favourable conditions to survive and cause disease. However, nutrition of sheep depends much on feed availability which in most cases depends on climate. Feed availability is highly associated with climate in the sense that seasons affect levels of feed availability in a particular year (FAO, 2006a).

However all these factors can be addressed and modified by human beings due to the fact that human being is the managers ofboth environment and genetics of any particular animal. It is therefore of paramount importanceto understand well the socio-economic status of the communities dealing with such animals asthesocio-economic aspect is the basic factor on agriculture productivity (Otte and Chilonda,2002). The gender of household's headship for example is an important factor in theimplementation and adoption of technologies. They also give an insight of the knowledge ofthe generalbehavior and attitude of the people in a particular livestock subject matter. Abukhzam and Lee(2010) specifies that adoption and implementation of various innovations and technologiesdepends on many factors, of which these factors could lead to a targeted innovation user to either adopt or reject such innovation. These factors could be absence of users' involvement,lack of understanding, technical difficulties, lack of training and inefficient support from topmanagement and perceived innovation or technology complexity. However, involvement inlivestock production activities in most of the Tanzanian families are segregated into genderresponsibilities of husbands, wives, children and to some extent to hired labour (Abukhzamand Lee, 2010). In this study the status of household headship related to sheep ownership atArusha and Dodoma as selected study location is analysed and presented in Table 1 below.

However other socio-economic factors are also important in influencing the development of the sheep sub sector and in this case study they will be analysed systematically so as to come up with appropriate findings.

Table 1: Status of gender segregation of sheep ownership in Pastoralists and Agro-pastoralists in Arusha and Dodoma regions respectively by 2015

Region	Regional sheep number	Male headed hh owning sheep	Female headed hh owning sheep
Arusha	1,184,099	709,394 (59.91)	474,705 (40.09)
Dodoma	298,572	240,052 (80.40)	58,520 (19.60)

In brackets are the percentages.
Source: URT (2013)

3.2. Materials and Methods

3.2.1 Selection of study areas and participatory rural appraisal (PRA) description

3.2.1.1 Selection of the study areas

The sites for this study were guided by a choice of at least two regions which represent farming systems which have a significantly high population of sheep in the country. However, another criterion was the differences in the farming systems in which the sheep populations have distant genetic relationship. The farming systems referred to in this study were those defined by PADEP (2008); Perfect and Majule (2010)that livestock farming system as a component of a population of individuals in a particular geographical area which have broadly similar resource bases, enterprise patterns, household livelihoods and constraints, and for which similar development strategies and interventions would be appropriate. The two sites selected were the Northern Tanzania farming system under pastoralism and Central Tanzania under agro-pastoralism. In most cases sheep farming is a sub component of the Agro-pastoralist and Pastoralist systems. Pastoralism is more characteristic in areas of Arusha, Kilimanjaro, Singida and Manyara regions; whereas Agro-pastoralism features more in Dodoma, Singida, Shinyanga, Mara and Tabora regions. However in these areas cattle, sheep and goat population is higher than in other cropping farming systems. In Agro-pastoralist farming system, there is shifting cultivation of sorghum and millet because of continuous reduced soil fertility, while in the pastoralist sub farming system the economy is based more on livestock production, and where possible and permitted, agriculture is increasing as a component of household income. Livestock sales in these sites are however, the overwhelming source of income, providing about 80% of total income. Currently these areas are supplemented by far by only 5% crop sales (Andrews and Bamford, 2008). In both sub systems the population density is normally moderate with 30 persons per sq km and these areas suffer more on effects of limited resource base such as animal feeds, inadequate water and variable rainfall.

However, in this study where the case animal is a sheep, it is of imperative importance to consider sheep genetics aspect. So, a third consideration was the sheep genetics to guide the site selection on the aspect of sampling. So basing on the genetics the selection of site was guided by the study reported by Stephen *et al.* (2000). The diversity in sheep characterization by Stephen *et al.* (2000) was the justification of selecting Northern zone, i.e. Arusha region and Central zone, i.e. Dodoma region as representative sites for this study. The site selection further took into consideration of the two modes of livestock keeping. Nonetheless the representation further focused on the reflection of the two Tanzania rainfall patterns, whereby the Northern zone of Tanzania in a large extent is being represented by regions of bimodal type of rainfall, while that of Central zone are represented by unimodal regions of Tanzania (Figure 1 and plate 1).

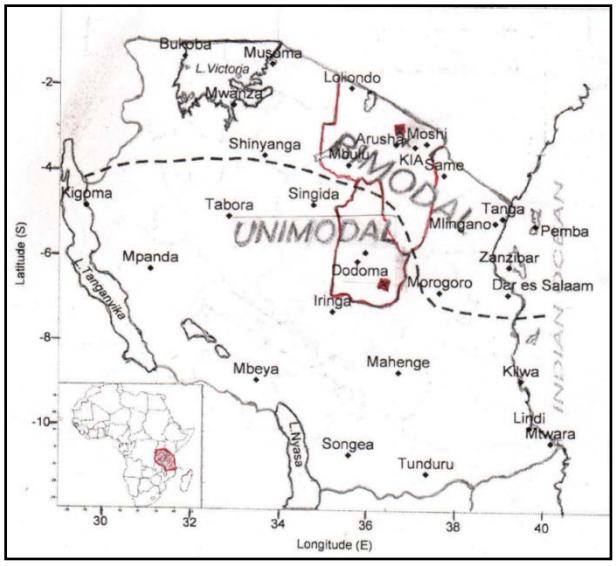
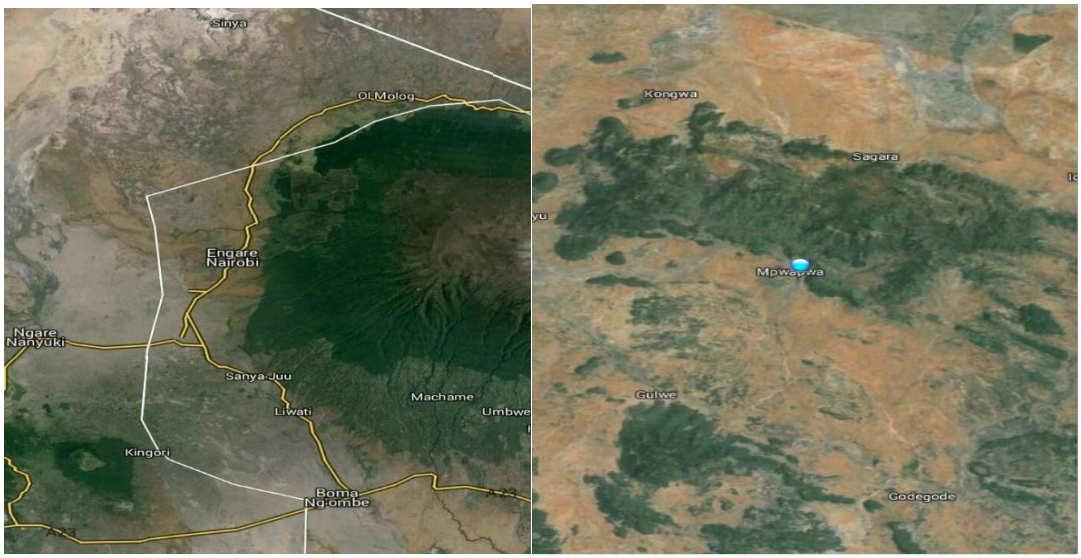


Figure 1: Tanzanian map showing the Study location (reddish spots)and rainfall pattern as separated by black dotted line fromWest to East.

(**Source:** modified from Timiza, 2011)

With the study site selection at Arusha region, the location of this study was at around latitude 3° 8' South and longitude 37°10' East which geographically is at an altitude of 1400 m above sea level (Timiza, 2011). This location is characterized by having a rugged forms of soil resulting from past volcanic activity. The area is at a large extent characteristic of bimodal type of rainfall with short rains in November to December and long rains beginning in mid March till late May. Its hottest season is in January to February (27°C) and cold months are June to August (15°C). The area is characterized by having *Acacia drepanolobium* woodland and *Combretum-Albizia*species in areas of low relief areas having soils with impeded drainage. *Croton-Dombeya-Albizia* species are common in the elevated land to the east on volcanic soils which also is associated with *montane-edge* species like the *Croton-Celtis-Lepidotrichilia* and *Acacia lahai* in eastern highlands. However according to Andrews and Bamford (2008) *Acacia riverine* woodland associated with dense *riverine* woodland with*Celtis, Albizia,Euclea,* and *Combretum* at the deep valleys to the north of the area (Plate 1a). Dominant soils are dark brown and silt loam without any major deficiency other than organic matter reflected in its extremely poor moisture retention (Perfect and Majule, 2010). Socially most of the inhabitants are pastoralists.

The study site at Central zone, mainly Dodoma region was focused at around latitude 6°21' South and longitude 36°29' East. The Central zone location is at a large extent characterised by unimodal type of rainfall. The area is threatened by risks associated with main agricultural production in particular livestock keeping. It is normally dominated by *Commiphora, Acacia sp., Tamarindus indica, Delonix elata and Adasonia* trees which are associated with *Aristida, Pennisetum, Cynodon and Themeda* indigenous grass species (Plate 1b). Most soils are low in nitrogen and phosphorus but adequate in potassium. Soil pH ranges between 5.6 and 7.7. Socially most people are agro-pastoralists, while those in peri-urban areas are now practicing zero grazing (Perfect and Majule, 2010). The zone experiences a dry Savannah type of climate characterized by a long dry season between May and November and short wet season from December to April with an average annual rainfall of 650 mm per annum.



a) Northern zoneb) Central zone

Plate 1: Google earth pictures for the study sites (a) Northern and (b) Central zones

3.2.1.2 Participatory rural appraisal (PRA) description

The understanding of the socio-economic set up of the communities involved in production of sheep in the study area employed a participatory rural appraisal (PRA), which was conducted at a household level to obtain information about households on various farm activities and socio-economic issues in relation to the sheep livestock sub-sector. Socio-economic data like flock population, flock movement trends, flock management and preference issues for sheep, numbers of entries and exits in the flocks were recorded.The study employed a multistage sampling where the traditional sheep production system was first clustered into pastoralists and agro-pastoralists. Therefore following such a protocol, at the Northern zone which have three regions namely Arusha, Kilimanjaro and Manyara, Arusha was purposely selected due to her large sheep population. For the Central zone with Dodoma and Singida regions, Dodoma was selected purposely by virtual of having a genetically characterized diverse sheep according to Stephen *et al.* (2000). At a region level, one district was selected at each region, and further two villages were sampled from each district. In the last stage (i.e. village) at least 40 households were sampled from each village to make a total of 160 households to be interviewed in the entire study. In case a selected village happened to consist of more than one sub-village, one of these sub-villages was randomly selected for the survey. The survey therefore employed a methodology used by Kosgey *et al*. (2006) and Getachew*et al.* (2010), but modified to meet the Tanzanian conditions by using a structured questionnaire and a checklist for key informants.

The study aimed at describing the production system of sheep in that particular area of Tanzania and understanding the current constraints to sheep production. The socio-economic factors were assessed based on the household gender

participation in sheep production activities and decision-making of utilization (consumption and sales) and their disposals. This was due to the fact that these factors could have an influence on the following variables: dependency ratio (i.e., number of people in the household depending on sheep), inference on land ownership, animal ownership, farm size, source of animals, population trends, breeds and crosses available in herd, flock management and preference issues for sheep. However, numbers of entries and exits within the previous 12 months of the survey and reasons for culling stock were recorded.

All possible socio-economic factors were studied to gather all variables which influence gender parameters like age and ethnic affiliation of the household head/ decision making were studied on the variables that relate directly to animal breeding (i.e., preference for sheep, and trends in breeds and crossbreds used).

To study the socio-economic factors which possibly influence sheep breeding in Tanzania, a set of questions were developed to capture breeding issues at farmer level in a questionnaire. The questionnaire was also prepared to capture the status of sheep production systems being practiced basing on livestock-environment interaction, herd structures, reproduction functions, survival rates of lambs and mature animals, disease incidences, sheep marketing and production constraints.

3.2.2Data analysis

The quantitative data from questionnaires were coded and entered in a computer and analysed for means, frequencies and percentages using IBM SPSS statistics version 20 computer programme, while the qualitative data from the checklist were synthesized and given inferences directly.

IV. Findings and Discussion

4.1 Sampling frame of the PRA

Sampling frame is presented in Tables 2. A total of 160 respondents were involved in the interview in the two regions (Arusha and Dodoma) and two districts (Longido and Mpwapwa) respectively. The two villages purposely selected from each district were Ngarenanyuki and Tingatinga from Longido, and Iyoma and Kisokwe from Mpwapwa. A total of 40 respondents mostly heads of household were interviewed from each village. This made a total of 160 respondents to be interviewed in the entire study.

Table 2: Sampling frame for the study area

Region (N=2)	District (N=2)	Wards (N=2)	Villages (N=4)	Respondents
Arusha	Longido	Tingatinga	Ngarenanyuki	40
			Tingatinga	40
Dodoma	Mpwapwa	Mazae	Iyoma	40
			Kisokwe	40
Total				**160**

Source: PRA data, 2016

4.2 Findings of the PRA study

4.2.1 Socio-economic status, activities and major sources of income

Socio-economics household information is presented in Table 3. In this study four vital characteristics namely sex, age, education level and household size were analysed for their relationship to sheep production activities. The four characteristics were further analysed and synthesized to generate descriptive information on aspects concerning performance of various sheep production activities. The results indicate that the majority (91.30%) of households at Mpwapwa district are male headed as compared to (8.70%) female headed households, while at Longido it is also majority for male headed households (77.50%) and (22.50%) female headed households.

This statistics has an implication on household decision making systems as for most sheep production activities male heads has the higher mandate of decision like on disposal or restocking of sheep in the household. The results further indicate that a majority of respondents were in the economically active age (20 – 35) years which is normally the age related to active innovations venture and labour provision for sheep activities, but this implies to resource ownership hence this is in favour of affordability of sheep sector and sub sector development. This age group is to a tune of 52.5 and 55% for Mpwapwa and Longido districts respectively. Results of this study further shows the relationship between education and sheep production activities. Results of the PRA indicate that majority of respondents have at least a basic education. This is due to the fact that about 90% (i.e. 18.75% having informal education and 71.25% primary education) for Mpwapwa district, and it is 93.75% (i.e. 58.75% with informal education and 35% with primary education) for Longido district

With this statistics it means that majority can read and write and therefore this could be explained as an opportunity for most of farmers to comprehend with most of the modern sheep technologies and innovations pertaining to sheep production which could be disseminated to them from research and extension services either through mass media and user friendly extension materials.

Table 3: Socio-economics household information

Respondents' Characteristics	Mpwapwa (N=80)	Loliondo (N=80)	Total (N=160)
Sex			
Male	73(91.30)	62 (77.50)	135 (84.40)
Female	7(8.70)	18 (22.50)	25 (15.60)
Total	**80 (100.00)**	**80 (100.00)**	**160 (100.00)**
Respondents' age			
Between 20 -35 years	42(52.50)	44 (55.00)	86 (53.80)
Between 36– 60 years	32(40.00)	28 (35.00)	60 (37.50)
Above 60 years	6(7.50)	8 (10.00)	14 (8.70)
Total	**80 (100.00)**	**80 (100.00)**	**160 (100.00)**
Education level			
Have never attended school	8 (10.00)	2 (2.50)	10 (6.25)
Informal education	15 (18.75)	47 (58.75)	62(38.75)
Primary education	57 (71.25)	28 (35.00)	85(53.12)
Secondary education	0 (0)	2 (2.50)	2(1.25)
College education	0 (0)	1 (1.25)	1 (0.63)
Total	**80(100.00)**	**80 (100.00)**	**160 (100.00)**
.**Household size**			
1-5 members	24(30.0)	18 (22.5)	42 (26.3)
6-9 members	48 (60.0)	44 (55.0)	92 (57.5)
Above 9 members	8 (10.0)	18 (22.5)	26 (16.2)
Total	**80 (100.0)**	**80 (100.0)**	**160 (100.0)**

Source: PRA data, 2016

It is well known that the household size has an implication on household labour force for sheep production related activities. The results in this study indicate that majority of households in the study area have an average of 6 – 9 family members, which is a sufficient number to provide adequate labour for rearing sheep from husbandry point of view and other managerial operations. Results further indicates that majority of households 60% (for Mpwapwa) and 53% (for Longido) practice and depend mainly on agriculture and livestock (Figure 2). However a reasonable portion also earn additional income from several off-farm activities. The off-farm activities are at a tune of (18 and 22%) for Mpwapwa and Longido districts respectively. This implies that a large part of the sample population depends more on agriculture and livestock, but also a good number of households earn a reasonable amount of income from other off-farm activities like petty business and wage employments. According to the survey respondents this additional obligation however has widened the labour requirement for the households as some member of households like children are more occupied with school obligations and this could be the reason why hired labour have come into play. It has been identified that off-farm activities mainly are set up by most households, when there is motivation of factors such as better returns in the off-farm sector relative to the farm sector; and this normally is included in particular to the inadequate farm output, resulting either from temporary events e.g. drought causing failure of crops and livestock mortalities, or longer-term problems like inadequate land and livestock market constraints.

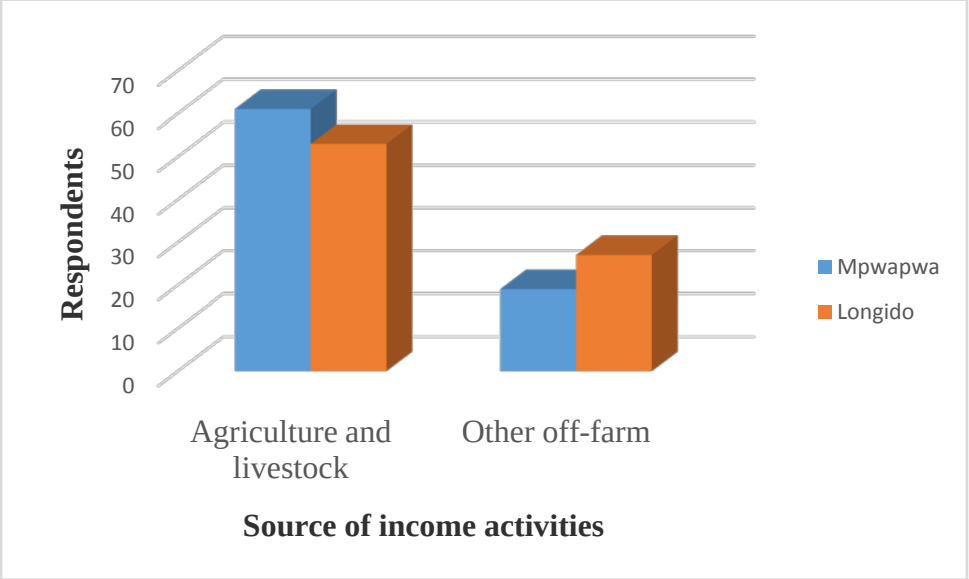


Figure 2: Distribution of households' major economic sources of income.
Source: PRA data, 2016

This has been in line with the findings observed by FAO (2012b) where it was noted that an absence of crop and livestock insurance and income management and consumption uncertainties by diversifying activities with returns have been among factors encouraging off-farm activities. Conversely business experience from the farmers practicing other off-farm activities like petty business could be an opportunity to the community and extension system as if farmers are given with capacity on managing livestock at business levels could be easily involved in issues like sheep fattening and selling of processed products from sheep. This could widen the scope from the current subsistence level of production to higher level where livestock farmers could change their current mind set to higher business level of production. Off-farm activities could further offer services and products upstream and downstream from livestock production as a business in the off-farm components of the food and by-products chain, which currently are critical to the dynamism of livestock sector (URT, 2015b).

Table 4shows the roles and capacity of households in Mpwapwa and Longido sites. Results indicate that women and children are responsible to most sheep activities like feeding, watering and sheep kraal cleaning. This was justified by the 68% of respondents indicating that women and children were more obliged. This gave a desegregation that roles of ensuring good welfare of sheep were done by women (31.25%), children (37%) and few men (25%) at Mpwapwa. On the side of Longido trend was almost same where 68.75% of respondents indicated that women and children were obliged. The desegregation of data revealed that pastoralist women were more responsible (56.25%) with sheep welfare, being closely assisted by children (12.5%) and their husbands (25%). However most of the decision making fallen under the mandate of males in most crucial aspect like on selling the livestock in the household. This results are in agreement with those reported by Ng'wandu *et al.* (2009) who have indicated that traditionally in Tanzania most of the decision making in the households is dominated by males and this comprise of most issues pertaining to resources ownership and utilization.

It was noted that women at Longido are more attached with sheep activities because they are the gender group which is more responsible with the family utilization of mutton and fat especially for women who utilize these products during their early maternity nursing, but this is contrary to when comes to selling of live sheep, where men become more prominent and responsible with the cash income and expenditure of the money accrued from the live sheep.

This could be the main cause of the slow adoption in some of the released sheep research and development (R&D) packages in the traditional communities, but the episode could be one of the contributing factors which subjects the sheep subsector to inadequate performance. It is further implied that as women being responsible for ensuring sheep welfare, they would prefer to invest their effort into sheep production, but the promotion of acquiring such venture and adoption of various technologies is more determined by a man who is not directly affected by the underperformance of sheep sector as woman do. However, consciousness in the recent formal education for children has also imposed an effect to the traditional sheep keeping system. Some households have resorted to hired labour. In this study hired labour has shown to be practiced by about 10% at Mpwapwa and 2.5% at Longido.

However hired labour has been pointed out to be unreliable in most cases. Furthermore it was noted that extensive and traditional system of keeping sheep is nowadays being threatened by inadequate land holdings. It is therefore opined that changes in mind set is now important and livestock farmers should be advised to at least adopt semi-intensive system and this system has to go hand in hand with a well-planned destocking of some of their animals for fattening and selling them in some of the lucrative markets. Semi intensive can be managed by family labour conveniently than the cumbersome extensive system. However this study has noted that knowledge of sheep keeping is centered more to men (52.5%) for Mpwapwa and (61.25%) for

Longido, which is not healthy as it could be better if such knowledge could be directed more to women who are the main sheep workers. Nonetheless extension and other stakeholders have to plan and work on it staidly.

Table 4: Status of roles played by different household members and hired labouron sheep production in Mpwapwa and Longido districts

	Districts			
characteristic	Mpwapwa		Longido	
SHEEP ACTIVITIES	Respondents Number	%	Respondents Number	%
RESPONSIBILITY				
Men (mostly HHH*)	40	25	20	25
Wives	25	31.25	45	56.25
Children	30	37.5	10	12.5
Hired persons	5	6.25	5	6.25
Total	80	100	80	100
KNOWLEDGE OF SHEEP KEEPING				
Men (mostly HHH*)	42	52.5	49	61.25
Wives	24	30	19	23.75
Children	6	7.5	10	12.5
Hired persons	8	10	2	2.5
Total	80	100	80	100

HHH* - Household head

Source: PRA data, 2016

Family farm sizes is presented in Table 5. Majority of respondents (81%) indicated that there was a shortage of land for satisfying both crops growing and livestock keeping in both districts. However tenser situation was obvious at Longido by virtue of having large livestock population and limited availability of land. Situation of land at Longido was worse due to the fact that about 34% of household did not own any land and most of them depended more on communal land for their livestock pasture. The land holding in both districts was indicated by 70% of livestock keepers having land for both crop and livestock less than 2hectares. Although livestock farmers at Mpwapwa had larger land holdings than Longido, agro-pastoralist were also facing space constraints because the average land holdings for the agro-pastoralist was reported to be limited (Table 6). Land holdings at Mpwapwa was reported on average to be 1.6 hectares for the entire farm and from this amount at least 1.2 had to be for crop growing. Land holdings for pastoralist was even worse as it was reported on average to be at least 0.9 hectares and most of them had started growing crops like cereals of which they have to grow crops like cereals on at least 0.1 hectares. This is so due to the fact that pastoralist (Masai tribe) are now changing their habit of eating meat, milk and blood only to also eating cereal grains like maize.According to Conroy. (2010) over the last 25 years, Masai tribe have rapidly converting semi-arid grazing areas to agricultural croplands. Part of their motivation has been to protect their land from encroachment by other ethnic groups, as crop farming have more secure land tenure than livestock keeping. The adoption of crop growing has allowed them to capitalize on the cash market for grain, diversifying their income by growing maize and beans, while at the same time expanding the livestock herds. So, by virtue of the carrying capacity basing on the livestock unit measure of carrying capacity most pastoralist face land space constraint.

Table 5: Family farm size in Longido and Mpwapwa district

Family farm size	Longido Frequency (%)	Mpwapwa Frequency (%)	Total Frequency (%)
0 hectares	34 **(42.5)**	0 **(0)**	34**(21.25)**
0.1 to 0.2 hectares	1**(1.25)**	1**(1.25)**	2**(1.25)**
0.45 to 0.5 hectares	1**(1.25)**	2**(2.5)**	3**(1.88)**
0.6 to 2.0 hectares	27**(33.75)**	23**(28.75)**	50**(31.25)**
2.1 to 4 hectares	14**(17.5)**	28**(35)**	42**(26.25)**
>4 hectares	3**(3.75)**	26**(32.5)**	29**(18.12)**
Total	80 **(100)**	80 **(100)**	160 **(100)**

Numbers in bold and brackets are percentages

Source: PRA data, 2016

This is because on average each house hold owns only 0.9 hectares which can support less than one Tropical Livestock Unit (TLU). So a thorough land planning is required to address such issue which have an implication to the livestock like sheep productivity and security at large. It could be true that even the

current land conflicts experienced nowadays could base on this fact (URT, 2015b)

Table 6: Farm ownership and utilization allocation

Farmer Category	Criteria	Farm size (Mean±se hectares)
Agro-pastoralist (Dodoma region)	Family farm size	1.6±0.08
	Land for crop growing	1.2±0.10
Pastoralist (Arusha region)	Family farm size	0.9±0.01
	Land for crop growing	0.1±0.01

Source: PRA data, 2016

4.2.2 Sheep flock population owned by farmer

In this study about 37.5% of the respondents owned 11 and above sheep at Mpwapwa while at Loliondo 92.5% of the respondents owned 11 and above heads of sheep. It seem that sheep is an important part of household wealth as almost every household must have at least a sheep. This results are in agreement with that reported by TALIRI (2014) which reported that 43% of the respondents interviewed in Mpwapwa district own sheep between 11-20, while only 39% had less than 10 sheep. These findings indicate that sheep is an important component of livestock in the Central and Northern zone farming systems. However it seem also that sheep in the Northern zone is even valued more as about 57% (more than half) of the households own more than 50 sheep in their flocks. On overall average about 65% of respondents in both pastoralist and agro-pastoralists communities have observed to have sheep flocks with more than 10 sheep (Table 7). This finding indicate that at least every household have at least 2 or more TLU from sheep alone of which 4.6 to 5.4 t of pasture per annum is needed (Nix, 2011). Such a requirement cannot be satisfied by most of the inadequately managed individual and communally owned rangelands (Nix, 2011).

Table 7: Sheep flock population owned by farmer households by districts

	Respondents		
Herd/flock size	**Mpwapwa**	**Longido**	**Total**
1-10	50 **(62.50)**	6 **(7.50)**	56 **(35.00)**
11-50	21 **(26.25)**	28 **(35.00**)	49 **(30.62)**
51-100	9 **(11.25)**	16 **(20.00)**	25 **(15.63)**
> 100	0 **(0)**	30 **(37.50)**	30 **(18.75)**
Total	80 **(100)**	80 **(100)**	160 **(100)**

Number in bold and brackets are the percentages

Source: PRA data, 2016

4.2.3 Mean flock and herd size for different species kept by farmers

In this study it was recorded that other livestock species kept together with sheep by households are cattle, goats, donkey and chickens. Mean herd and flock size kept by farmers at Mpwapwa and Longido districts is presented in Table 8. Species mean herd and flock sizes for Longido were significantly ($P<0.05$) higher than those for Mpwapwa. Mean herd and flock size for cattle, goat, sheep and donkey were 105, 78, 74.5 and 4 respectively at Longido; while it was 28.45, 25.5, 22.5 and 1.35 respectively for Mpwapwa. However, Mpwapwa had significant ($P<0.05$) higher mean flock size of chicken than Longido (15 vs 8). The size of herd and flock is an important information for a farmer or manager of any livestock farm. This is an important aspect because it gives an important data for calibrating the right carrying capacity (CC) for any particular herd or flock (Nix, 2011). According to De Leew and Tothill (1990), CC is defined as the maximum possible stocking of herbivores that rangeland can support on a sustainable basis. Estimates of CC are commonly based on the assumption that livestock require a daily dry matter (DM) intake which is normally equivalent to 2.5 to 3.0% of their bodyweight for ruminant animals. Thus, for a tropical livestock unit (TLU) of 250 kg of weight, 2.3 to 2.7 t of dry feed per annum is needed. Nix (2011) and Otte *et al.* (2002) have indicated the TLUs of cattle, sheep and goats to be 1.0, 0.11 and 0.10 respectively. For the land being owned by farmers in the two sites as has been indicated before, and the number of livestock owned by the households it can be generalised that resources like pasture and other feeds are not enough. This is because grazing efficiency or the proportion of total herbage livestock can harvest should base on addressing the forage loss (due to trampling, fouling and decomposition) and proper use which is the maximum proportion of forage that can be grazed without causing rangeland deterioration. It is therefore true that in both agro-pastoral and pastoral areas of Tanzania in the traditional system these factors are not considered at all. This could be among aspects which causes the under nutrition of most livestock like sheep especially during the dry season, and this could be one of the basic factor which leads to poor performance of sheep in terms of production, reproduction and productivity. So most our local government authorities (LGAs) have to put into consideration of CC aspect whenever performing land planning for both crops growing and livestock rangeland issues.

Table 8: Mean herd and flock size for different species in the study area

Specie category	Mpwapwa (N=80)	Longido(N=80)	Overall Mean (N=160)
Cattle mean herd size	28.45	105	66.73
Goat mean flock size	25.5	78	51.75
Sheep mean flock size	22.5	74.5	48.50
Donkey mean herd size	1.35	4	2.67
Chicken mean flock size	15	8	11.50

Source: PRA data, 2016

4.2.4 Purpose of keeping sheep

Purposes of keeping sheep is presented in Table 9. The purposes of keeping sheep were captured from respondents using participatory methods of which they were allowed to mention them and then thereafter rank them. Purposes mentioned were: (i) keeping for sale, (ii) live bank, prestige, dowry and rituals and (iii) meat for home consumption. The reason for sale took an upper hand, and at Mpwapwa it was mentioned by 75% of respondents, followed by live bank, prestige, dowry and ritual reasons (21.25%) and last one was meat for home consumption (3.75%).

Table 9: Purpose of keeping sheep

Purpose of keeping sheep	Districts		Total
	Mpwapwa	**Longido**	**Total**
For sale	60 **(75.0)**	26 **(32.50)**	86 **(53.75)**
For meat	3 **(3.75)**	20 **(25.0)**	23 **(14.38)**
For live bank, prestige, dowry and ritual	17 **(21.25)**	34 **(42.50)**	51**(31.87)**
Total	80 **(100.00)**	80 **(100.00)**	160 **(100.00)**

Numbers in bold and brackets are the percentages.
Source: PRA data, 2016

At Longido live bank, prestige, dowry and ritual was the leading reason (42.5%), followed closely by sales (32.5%) and the last one was meat for home consumption (25%). Results show that Mpwapwa used sheep for sale more than Longido, while Longido surpassed Mpwapwa in sheep utilization for meat. However in both sites it was mentioned that marketing was not well-established and there was a need for stakeholders to improve the marketing infrastructure for both live animals and animal byproducts like meat and skins. Respondents at Longido complained more on the sheep skins processing and marketing and they said it categorically that government have not involved herself fully to rescue the processing sector as most Masai have been left alone in the hides and skin processing sector. On the other side, Mpwapwa respondents complained more on live and meat marketing infrastructure issues. Generally it was noted that currently there are no clear policies which can deliberately address the skin and hides processing and marketing. There could be policies meant for the skins and hides, but farmers think that these policies are silent. They recommended to the government to address these issues effectively.

Famers categorically pointed out that regular cash income and an insurance against emergencies were the highest priorities to their sheep flocks. About eighty percent of the farmers reported animal sales over the previous 12 months. Of this income it was said to be spent for procurement of food (42%), farm inputs (19%), hospital expenses (15%), children school needs (14%), social dues (5%) and restocking of livestock.(5%). From this statistics it is obvious that sheep contributes enormously to the household on daily needs.

Although farmers disregarded sheep by ranking it as an inferior livestock in their herds, farmers still expressed their need of having these animal species. The ways in which they acquire sheep was narrated as shown in Table 10. Most sheep were born and raised in the flock with an overall mean of 58.13%. A big share (66.25%) of agro-pastoralist from Mpwapwa indicated that most sheep were born and raised in the same flock, while (50%) of pastoralist from Longido indicated same way of acquisition. Acquisitions by restocking through buying from elsewhere basing on breed merit was the least scored (2.5%) way of acquisition by Mpwapwa households and 17.5% by Longido. Both agro-pastoralists and pastoralists used a mixture of ways where they acquired sheep elsewhere out of their flocks, but also depending on their own stocks by of course selecting within and raising them in the same flocks. About 27.5% and 26.25% of Mpwapwa and Longido households respectively used this means of acquisition.

This analysis infers that most of livestock farmers in both sites retain most of their sheep for longer time and this way of acquisition is dominant and therefore could be the major cause of inbreeding in most flocks. This episode could be important to know because it is in this understanding that breed improvement could be rectified by educating livestock farmers on the disadvantages of recycling animals within same flocks especially in most of the small population genetic pools.

Results has shown that at Longido few farmers (about 17%) are now aware of the improved sheep breeds, and during the PRA some flocks proved to be real improved, and this was because farmers were buying some improved rams from elsewhere like government and large private and parastatalfarms like Tanzania Livestock Research Institute (TALIRI) and National Ranching Company (NARCO) in West Kilimanjaro which have improved breeds like Blackhead Persian and Doper breeds, but some farmers were even crossing borders to the neighboring countries like Kenya to buy sheep basing on their merits. This knowledge and awareness was lacking at Mpwapwa and extension and research system need to exhibit and take some deliberate effort of educating farmers on the potential of using improved breeds to enhance their flock productivity. Farmers need to be enlightened on the potential of sheep in terms of its

low land holdings requirement and the big demand of live sheep and mutton from overseas like Arab Emirates, but also their complementarity with other livestock in the farming system. Research and extension systems have to play this role and enlighten farmers on generating technologies like good breeds and breeding technologies and on how the sector could reward farmers if at all these technologies are utilized fully.

Table 10: Ways in which sheep are acquired in the flock

Ways of obtained sheep	**Respondents/Percent**		
	Mpwapwa	**Longido**	**Overall**
1. Born and raised in the flock	53 **(66.25)**	40 **(50.00)**	93 **(58.13)**
2. Acquired elsewhere out of the flock	3 **(3.75)**	1 **(1.25)**	4 **(2.50)**
3. Born and raised, also Acquired elsewhere	22 **(27.50)**	21 **(26.25)**	43 **(26.87)**
4. Bought from elsewhere basing on breed merits	2 **(2.50)**	14 **(17.50)**	20 **(12.50)**
Total	80**(100)**	80**(100)**	160**(100)**

Numbers in bold and brackets are the percentages.
Source: PRA data, 2016

4.2.5 Preferred breeds, breeding methods and breeding ratio analysis

4.2.5.1 Preferred breeds

Sheep breeds kept by most households in both sites are Gogo (or fat tailed sheep), Red Masai, Long tail Sukuma and Black head Persian (BHP). These are the most dominant types kept but of course there other strains from Iringa and Morogoro origin. However Gogo sheep was the most prominent sheep ecotype in Mpwapwa district, while Red Masai was more conspicuous sheep ecotype in Longido district. The survey shows that, in both districts despite of having more prominent Gogo and Red Masai sheep there are also some crosses which are resulting from crossing with some improved breeds like BHP and Doper. Smallholder and commercial farmers are now opening up their minds towards investing in sheep ranching and several requests for breeding animals are now increasing at the government farms (TALIRI, 2014)

4.2.5.2 Breeding methods

The respondents indicated that, almost all farmers (100%) are using rams (natural mating) for breeding purposes. Farmers normally practice a traditional production systems where breeding is indiscriminative and often uncontrolled. Ewes are bred using the community grazing opportunity. The source of breeding rams were from own herd (60%), from neighbour (21.2%) and purchase (18.8%). Breeding is generally uncontrolled in both districts as most of the breeding rams are selected within each flock, and ram to ewe ratio was about 1:5. Some farmers had at least one or several, rams for breeding purposes. These rams mated randomly in the communal grazing system making it next to impossible to practice controlled breeding. Results of this study show that about 52% of the respondents had more than 10 rams in their flock (Table 11). It was noted that in most flocks rams are born and raised right in that particular flock as a result inbreeding was obvious. The mating ratio of 1:5 is not considered appropriate and healthy for breeding and economics point of view as a ratio of 1:20 is recommended. So to rectify this aspect farmers have to be educated and made aware of the detrimental effect of in-breeding depression. They have to gain the capacity to understand that in-breeding is much expected as most flock members are born and left in the flock and that they are allowed to go on with random mating with ewes of the same family. Some on-farm demonstration could be an area to enlighten farmers. Some workers (Gizaw *et al.,* 2013) have demonstrated and came up with findings of improvement in growth, body weights, fertility of ewes and survival of lambs through such programs. Gizaw *et al*.(2013) recommended to dispose of most of the extra male lambs for better result.

Table 11: Male sheep flock composition

Category	**Intact adult males**	**Percent of owners**
1.	0	37.5
2.	1-9	10.0
3.	10-15	39.4
4.	15-30	6.9
5.	>30	6.2
Total		**100.0**

Source: PRA data, 2016

This is so because even the young male lambs are not disposed or castrated after reaching their weaning, puberty and mature age (Table 12). Farmers could be advised to have an organised livestock breeding systems to avoid inbreeding and reduce the number of breeding rams to a recommended male to female ratio by using those few superior rams of preferred traits. In this study it was found that the breeding knowledge is lacking and therefore farmers need to be trained on proper animal husbandry and breeding practices to assure quality breeding programs. The lack of performance recording among farmers was also noted in the study area, and this was the limitations to the accuracy with which high performing animals can be identified from this genetic pool. Research and Extension systems have to draw such plans or programs and supervise their implementation. Breeder associations or groups could be an

avenue to ownership of such breeding programs and conservation of breeds like the superior Gogo and Red Masai

4.2.5.3 Breeding ratio analysis

The analysis of breeding ratio was conducted to identify the real situation of sheep flock in the study area. This is shown in Table 4.13, which indicates the correlation analysis of male to female ratio in the flocks. It was revealed that adult male sheep population significantly (P<0.01) correlated posively (r=0.56) with females in the study area. Nonetheless intact weaner male population significantly (P<0.001) correlated posively (r=0.72) with females in the site. This means that at any particular time the ratio of males and female was almost constant at 1:5 and this could be so because proper plans for selecting the best sires for the next generation are lacking, but also strategies for castrating and disposing extra rams are also inadequate.

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Table 12: Number of intact weaner male lambs ownership

Category	Intact male lambs	Percent of owners
1.	0	40.6
2.	1-10	48.8
3.	11-50	5.6
4.	>50	5.0
Total		**100**

Source: PRA data, 2016

4.2.6 Traditional management systems of sheep in Central and Northern zone

4.2.6.1 Sheep housing in the study area

Housing is an important structure if sheep are to produce optimally. The basic requirement of good animal housing is that which can modify the environment for the benefit of animals and also protect them from predation and theft (ESGPIP, 2009). Sheep housing should buffer the animal from climate extremes to reduce stress allowing optimal animal performance in terms of growth, health and reproduction.

Table 13: Correlation of males' number and flock populations in the study area

Correlated variables		Control variable	Correlation level	Degree of freedom	Significance level (2-tailed test)
Total number of sheep	Number of intact adult males	Number of females	0.56	156	0.01
Total number of sheep	Number of intact weaner males	Number of females	0.72	156	0.001
Total number of sheep	Number of intact male lambs	Number of females	0.157	156	0.15

Source: PRA data, 2016

The main climatic factors from which a house protection is needed are high and low ambient temperatures, environmental humidity, solar radiation, wind and rain. Furthermore, houses are important in protecting feed and equipment from damage, in saving money and labor, and in aiding effective management, including breeding. Sheep housing should meet animal requirements for proper ventilation and serve producer's needs at the lowest possible cost. Housing in the study area was inadequate and primitive for most flocks as most farmers used kraal as common shelter for sheep and other livestock. Most shelters were inadequately drained. Some sheep especially young lambs were housed in family houses of which this could be detrimental as serious consequences could be experienced if an outbreak of zoonotic diseases like tuberculosis and brucellosis could occur. Diseases such as coccidiosis and parasites e.g. mange and fleas could also be notorious to family members. Infectious diseases like pneumonia, CCPP and coccidiosis claimed lives of many lambs because of inadequate ventilation and humidity. Husbandry and other sheep welfare are important and extension system should deal with issues like proper housing of sheep.

4.2.6.2 Feeds, feeding, grazing and pasture information

Results of the interviewed farmers (N=160) in the study area about 84.7% indicated that the predominant source of forage was communal and family fallow lands with natural pasture species. About 72.4% of livestock farmers in the surveyed area said they utilize crop residues from own farms and/or neighbours' farms for feeding their sheep during harvest and during dry season. Common crop residues used include maize stovers, wheat straws, sunflower residues, sweet potato vines and groundnut residues. The results indicate that only 2% of the interviewed farmers had planted improved forages. Overall mean land area used for improved pasture establishment was about 0.125 hectares only for Mpwapwa and none for Longido districts. However, it was pointed out that only farmers with enough land to a tune of 10 hectare or above have tried to adopt such innovation. If that is the case then it is obvious that only 30% of livestock farmers can venture in this innovation because there are only 30% of farmers owning such land area. Farmers indicated clearly that the reason for not engaging in pasture production was lack of knowledge on pasture establishment. This was mentioned by (58.8%) of respondents, while some (20%) said there was plenty of natural pastures and there was no need of indulging themselves in such a cumbersome job. The rest (21.2%) indicated that a combination of inadequate knowledge, pasture seeds and limited land for pasture establishment was the bottleneck to adoption of such innovation.

It was noted that a significant number of farmers (49%) were not supplementing their animals (Table 14). The largest portion of farmers who did not supplement their sheep was from Mpwapwa district (80% of the respondents). The smallest portion was from Loliondo (18% of the district). The main reasons for not supplementing were the high cost of feeds (47.6%), unavailability of feeds (28.6%), lack of knowledge (14.3%) and (9.5%) were those farmers who did not see the logic of supplementing sheep because of the availability of natural pasture. The survey revealed that supplementary feeding in the areas was mainly done during the dry season.

Table 14: Response from farmers on the issue of supplementation

Do you practice dry season supplementary feeding?	Respondents for each districts		Both districts
	Mpwapwa	Longido	Total
Yes	16 (20)	65 (81.3)	81(50.6)
No	64 (80)	15 (18.7)	79(49.4)
Total	80 (100)	80 (100)	160(100)

Source: PRA data, 2016

Among the small portion of farmers who supplement in dry season for different kinds of supplements were mainly supplementing using cereal bran from their own milled cereals (64%), sunflower seed cakes from their own pressed oil seeds (60%) and crop residues from their own farms (86.9%). Very few farmers (5%) were feeding supplements at a required needy time, but also very few farmers (5%) buy these products from animal feed dealers whenever need arises (e.g. during dry season feeding). However, all farmers (100%) were feeding sheep together with other animals a reserved standing hay from fallow and communally owned land during the dry season. The survey revealed also that 100% of the interviewed farmers were not including minerals and vitamin supplements in their home made rations. Farmers however indicated that neither of these feed resources satisfied the demand for supplementing all livestock species and therefore only important categories of livestock like milking cows and sick animals benefit from the supplementation. It is therefore apparent that sheep was the most disadvantaged animal in many households at Mpwapwa district, of which contrary to Mpwapwa, sheep at Longido were valued much more by the pastoralists Masai women. When farmers from Mpwapwa were asked about this discrimination they said that sheep is not an animal to depend on. In reality this was not true because it was noted that sheep was very close to goats for the numbers of disposal in form of sales for household needs in both districts. Chicken was forefront registering about 50% of all sales in the household, followed by goats (25%), then sheep (20%) and the last one was cattle (5%). Although the coping mechanism would be to sell some animals to solve some household issues and dues, often agro-pastoralists and pastoralist could not sell cattle on regular basis because of most farmers having a deep socio-cultural values associated with cattle, an affair that force them to sell cattle only when there is a very burning issue, and that issue must be that of large monetary household demand. So this study calls upon a thorough study to identify the real situation about livestock off-take as the current national indices could be unrealistic. During the study it was noted that sheep is one among species being sold in many meat sales auctions.It is true that majority of Tanzanian consumers prefer goat meat making mutton to be an alternate source of meat, but in real sense it have been noted that in most cases mutton has been a common adulterant in goat meat for most traders to minimise costs in a cooked goat meat commonly known as mutton soup in many restaurants (DLFO Mpwapwa personal communication, 2014). Currently customers are buying meat depending on specie when they right see a particular carcass, and therefore there is a by-law of keeping the goat tail for justification, but most of the hoteliers buy small ruminant carcasses regardless of specie. This is encouraging because the current notion can come up with a change in consumption habits, which normally is a common phenomenon in many countries especially when there is scarcity in most commodities (FAO, 2013). Campaign like those of milk drinking could be an avenue to promote mutton consumption, but also it is true that we have not exhausted the overseas market, so there is still a room for promotion.

4.2.6.3 Water sources and availability

A good water supply for sheep is that which satisfies the requirement for both quantity and quality of water (Schlink *et al.*, 2010). A good water supply is important to the livestock because total water intakes are positively related to feed dry matter (DM) intakes (Thornton, 2010). Analysis of water sources in this study has shown that farmers depend on water from different sources for various purposes.

It was revealed that majority of farmers (55.7%) depend water supply from underground wells, dams and charcoal dams. Other sources of water in the study area include ponds and at a limited extent piped water systems which are available at a competition with other human needs. The results have also shown that the status of availability and affordability of water from different sources was described as available and cheap during the rainy season, but expensive and not available during the dry season. Inadequacy of water during the dry season play a negative role in sheep production in terms of growth and reproduction. However lack of water especially during dry season restricts disease control plans due to the fact that most dip tanks for control of external parasites like ticks, lice and mange are not operational for the routine dipping.

4.2.6.4 Diseases and common parasites in sheep at the study area

From the analyses and synthesis of the PRA conducted in the study area the most common external parasites in sheep mentioned at Mpwapwa are mainly ticks, while at Longido are ticks and tsetse flies. Other occasional external parasites mentioned in both sites include flees and lice. Worms are the only most troublesome internal parasites mentioned in both districts. A complain raised at Mpwapwa for internal parasites was a problem of round worms which was confirmed by Tanzania Veterinary Laboratory Agency (TVLA) Mpwapwa that most samples submitted in the laboratory from the study area were diagnosed positive for *Haemonchus spp* (82% of all samples) and this was ruled out to be a major problem. Other isolated worms were *Trichostrongylus* spp (12%) and *Oesophagostomum* spp (6%). At Longido there was a big complain of disease syndrome which kills up to 50% of animals during its outbreaks. Some farmers complained of losing up to three quarter of their flocks.A follow up made by the PRA team at the TVLA Arusha, came to identify that the problem was a disease known as Cysticercosis which is mainly caused by *Taenia multiceps*. This was first diagnosed through clinical signs related to Central Nervous Signs (CNS) or gid. Some complications on blindness was observed from diseased sheep. However, the necropsy findings observed were the reddish or gray purulent tracks in the brain which were normally left by migrating larvae. Some mature *T. multiceps* Coenurus with a size

of 2-6 cm in diameter were isolated. When some samples were submitted to TVLA Temeke with through use of enzyme-linked immunosorbent assays (ELISA) and Polymerase Chain Reaction (PCR), the parasite was identified to be *Taenia multiceps*.According to (IVIS, 2003) this is a disease condition which is acquired by eating tissues from a variety of intermediate hosts including ruminants, rabbits and rodents. Intermediate hosts are usually herbivores like sheep, but larvae are also reported occasionally in dogs and cats. An intermediate host becomes infected when it ingests eggs (or proglottids containing eggs), that were shed in the faeces of the definitive host. The eggs can be carried on fomites, and may be disseminated by coprophilous insects and birds. Grazing animals can acquire the eggs on pastures, in vegetation, or in contaminated water. However famers are always advised to deworm their herbivorous and petty animals regularly and should avoid giving their petty animals like dogs and cats raw meat from dead animals, therefore should incinerate or bury deep under the ground their dead animals. Most pastoralist keep on moving with their animal (Cattle, sheep and goats) with their security animals especially dogs. During movement, hygienic practices like toilets are not that much adhered to and therefore the life cycle of the Coenurus is not that much controlled and this make the extension system through animal and public health to educate both pastoralist and agro-pastoralist on the control of the disease. Farmers in both districts complained also on frequent abortions especially during dry season. However the blood samples taken by TVLA Mpwapwa for Mpwapwa district and TVLA Arusha for Longido ruled out Brucellosis as less than 1% of the randomly blood samples collected were positive to Rose Bengal test. The abortions observed could be due to pregnancy nutritional stress. Nutrition is an important factor which affects performance of sheep. Poor nutrition especially with minerals results in low rates of production, often defined by growth and reproduction. It also affects the immune system and the ability of an animal to fight disease. In extreme conditions of malnutrition, embryo, lamb and even adult animal death can occur (Dobson *et al.*, 2012)

4.2.6.5 Routine prevention and treatment methods of diseases and parasites insheep flocks

Most farmers are using various methods for disease prevention in their flocks. In this study the choice of disease preventive measures practiced by farmers was analysed. The attributes were ranked on the basis of two criterions i.e. practiced or not practiced. A multiple responses analysis for varieties of methods used was run. The methods analysed were control of external parasites, vaccination and deworming. The analysis indicated that 48.8% of the interviewed farmers in both districts were vaccinating their animals. About 46% of the farmers were dipping or spraying their flocks. However it was revealed that 16.7% of respondents were using traditional herbs as preventive measures for tick borne diseases and worms. It was revealed that the vaccination programme in both districts of Mpwapwa and Longido was not well organised and follow-up by farmers was inadequate. The vaccination frequency was minimal on annual basis (one or none) at Mpwapwa district compared to (about two) in Longido district. In overall terms the rate of vaccination was minimal and therefore both district extension system try to devote most of their efforts only on poster advertisements aiming at educating farmers to adhere to vaccination programmes on diseases like anthrax, black quarter and PPR whenever such vaccines are released by the LGAs. Nonetheless farmers complained more on the inadequate extension services and unreliable supplies of veterinary drugs and chemicals. These commodities were expensive and sometimes these commodities had poor quality. Farmers urged the extension system to address this problem accordingly.

V. CONCLUSION

From the findings of the present study, it can be concluded that despite the potential and existence of several opportunities from the traditional sheep sub sector, improvement and utilisation of the sub sector could only be improved if there will be full involvement of all stakeholders, which include government and non-governmental institutions in the sheep promotion. Both research and extension systems need to be supported fully with good policies to improve livestock farmers accessibility to improved grazing, supplementary feeds and water packages.Genetic potential of both traditional and improved sheep, sheep husbandry and disease control programs need to be dealt with accordingly. But also there must be deliberate efforts of improving sheep farmer and traders accessibility to markets, processing and value addition technologies. The sheep value chain system need to be developed and put in place for each and every actor to play their roles.

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