# Prevalence of Major Goat Diseases and Mortality of Goat in Daro-Labu District of West Hararghe, Eastern Ethiopia

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## Abstract

The study was designed to investigate economically important goat diseases in Hararghe Zone, Eastern Ethiopia. A stratified single-visit multiple subject formal survey was conducted in different agro ecological zones in Daro-labu districts of western Hararghe using structured questionnaires together with PRA tools to collect information. One hundred eighty households were randomly selected for this study. The data were analyzed using descriptive statistics and ranking techniques. The study indicated that Pest des Petit Ruminants, pasteurellosis and anthrax were the first, second and third top devastating diseases causing high mortality and morbidity with an index of 0.42, 0.25 and 0.20, respectively. Disease, predators and abortion were the top three causes of goat death with indices of 0.45, 0.3 and 0.13, respectively. Pre-weaning mortality of male and female kids in last 12 months were 2.1 and 2.5, respectively in lowland areas; whereas in midland it was 0.6 for male and 1.5, for female and in highland the corresponding pre-weaning mortality was 0.3 and 0.4 for male and female, respectively. Mortality was significantly higher in lowland agro ecologies where there are minimal infrastructures. The higher mortality rates observed in this study directs the need for better management and disease control practices.

**Keywords:** Agro-Ecologies, Abortion, Disease, Mortality

## Introduction

In Ethiopia directly or indirectly disease is one of the major barriers for the improvement of livestock production, reproduction and marketing. Diseases of various origins (bacterial, viral, parasitic, etc.) are among the numerous factors responsible for poor production and productivity.[1, 2] Small ruminants especially goats are among the livestock species that are densely populated in Ethiopia and mostly their productivity is hampered by prevalence of different diseases. The goat population of Ethiopia was estimated to be 21,884,222.[3] The country holds 13.5% of the African goats' population.[4] However, the country is not making use of this huge potential attributed to different constraints among which disease stands in the front line.[1, 5] Parasitic diseases also play a detrimental role in hampering small ruminant production leading to serious economic loss.[6] The annual economic loss due to disease, mortality, reduced reproductive and productive performance was estimated by 150 million USD.[7] In Ethiopia, 5-7 million sheep and goats die each year due to disease and the overall economic loss from meat industry due to parasitic diseases is estimated at 400 million annually.[8]

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Despite such production challenges in Ethiopia; farmers prefer to rear goats for their low cost of production, prolificacy, for the adaptive capacity of goats to hot environment through dynamic feeding behavior and fast reproduction cycle and growth rate. The degree to which goats survive to marketable age is one of the key indicators of the efficiency of goat production. Goat survivability in the village condition is one of the main factors that adversely affecting goat production and it will remain the major form of productive wastage resulting in sizable economic losses in goat farming unless there is an intervention to curb the problems. There is a need to assess the prevalence of diseases and the severity of goat mortality under village condition to recommend disease control practices to reduce kid mortality. This study area particularly in western Hararghe there is a scarcity of information concerning the small ruminant disease, prevalence and mortality. Therefore, the objective of this study is to assess the diseases that affect goats and the annual mortality of goats in the study area.

## Materials and Methods

**Study Area:** The study was conducted in the Daro Labu district of the Western Hararghe zone of Oromia regional state, eastern Ethiopia. The district encompasses three distinct agro ecologies and different farming system (mixed farming, agro pastoral and pastoral) the altitude ranges from 1300 - 2450m asl with average annual rainfall of 963 mm with erratic distribution with a temperature that ranged from 14 to 260c.The area is predominantly known for cash crop production particularly coffee and chat.
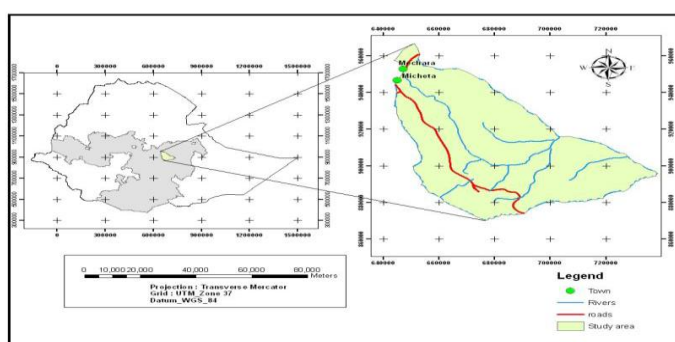


**Figure 1:** Map of the study area

Sampling procedures and Data Collection: Stratified random sampling technique was used to determine the sampled households. On the first place the area was stratified into three agro ecological zones lowland, midland and highland based on altitude and farming system. From each agro ecological zones goat owners were randomly

sampled. A total of 180 households were selected from a total of 9 Kebeles. Kebele is the smallest administrative unit in Ethiopia.

Data management and Statistical Analysis: A single-visit multiple subject formal survey technique[9] was used for data collection using a structured questionnaire. The questioner was translated into local language in order to make the farmers understood the question and respond and give us clear and relevant information. Major disease, seasonal out breaks, goat mortality, major health problems, and susceptible age categories of goats were some of the data collected. The data was analyzed using statistical package for social science (SPSS) software.[9] It involved descriptive statistics such as means, proportions, ranges and standard deviations. Index method of ranking was also employed to rank different parameters during analysis. To support the structured questionnaire, focus group discussions were made with different representatives of the community such as elders, community leaders, women, model goat owners, traditional livestock health practitioners, development agents, district officials and veterinarians.

## Result and Discussion

Major Causes of Goat Death: Farmers have listed a number of factors that cause goat mortality in the study area. Among which diseases, predators, abortion for different reasons, accident (crash, flood and fall at steeply sloppy grazing field) and poisoning (plants, snakes and rarely chemicals) were the major causes of goat death. In all of the three agro ecological zones similar factors were indicated as causative agent for high mortality of goat. Disease ranked as the primary cause of death with an index of 0.45 followed by predators, abortion, accident and poisons with an index of 0.30, 0.13, 0.10 and 0.01, respectively (Table 1). The result was in agreement with who reported diseases as a major health problem in small ruminants. The aggregate predisposing factors for the death of goats were starvation, hypothermia, pneumonia, malnutrition, digestive and gastrointestinal problems (scours), infectious diseases, internal parasites, accidents and predators. Proper feeding and husbandry practices and health management is recommended to minimize the threat factors.[10, 11]

Prevalence of Goat Diseases: The study revealed that a viral disease, Pest des Petit Ruminants (PPR) is the leading disease that affect goat followed by pastuerellosis across all agro ecologies. According to this study PPR,

pastuerellosis and anthrax were the top three prevalent diseases which affect productive and reproductive performance of goat and causing high mortality with an index of 0.42, 0.25 and 0.20, respectively (Table 2). PPR is a newly diagnosed disease and it is widely distributed disease affecting sheep and goats and the virus spreads very rapidly and present in high amounts in body excretions, especially diarrheic feces.[12] Lumpy skin disease and goat pox were comparably more serious in lowland arid areas than in midland and highland agro ecologies. Sheep and Goat Pox (SGP) is a disease that results in a substantial loss in the production and productivity of sheep and goats in Ethiopia.[13] Study elsewhere in Ethiopia indicates anthrax has a tremendous effect on small ruminant productivity.[10]

Susceptible age category of Goats to Major goats' diseases: Susceptibility of different age categories of goat to major prevalent diseases was presented in Table 3. Almost the entire respondent (92.8% and 91.7%) indicated that pastuerellosis and anthrax affect all age groups, respectively. In the case of PPR, the majority of the households (60.6%) pointed out it affects all age categories of goat but some of the respondents 12.77%, 11.1% and 10.0% indicated it usually hurt , medium age, older ages and kids, respectively.

Seasonal Occurrence of Major goats' diseases: Some of the farmers (26.7%) indicated that PPR appears all over the year and the rest 43.3% and 30% point out that it frequently emerge during wet and dry season, respectively. The majority of the respondent (57.2%) also discovered that pastuerellosis becomes visible throughout the year. Pastuerellosis occurs in the wet and dry season as responding by 28.9% and 13.9% respondents, respectively. Anthrax regularly happens throughout the year as responding by 72.8% of the interviewees and 17.8% in wet and 9.4% in dry seasons.

**Table 1:** Ranking of Major causes of goat death in different agro ecologies of the study area (%)

| Causes Goat death | Low land | | | | Mid land | | | | High land | | | | Over all | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Rank 1st | Rank 2nd | Rank 3rd | Index | Rank 1st | Rank 2nd | Rank 3rd | Index | Rank 1st | Rank 2nd | Rank 3rd | Index | Rank 1st | Rank 2nd | Rank 3rd | Index |
| Predators | 1.7 | 71.7 | 21.7 | 0.28 | 3.3 | 76.7 | 18.3 | 0.30 | 16.7 | 53.3 | 25.0 | 0.30 | 7.2 | 67.2 | 21.7 | 0.30 |
| Disease | 93.3 | 3.3 | 1.7 | 0.48 | 93.3 | 6.7 | - | 0.49 | 51.7 | 31.7 | 16.7 | 0.39 | 79.4 | 13.9 | 6.1 | 0.45 |
| Accident | 1.7 | 10.0 | 26.7 | 0.09 | 1.7 | 8.3 | 38.3 | 0.10 | 13.3 | 1.7 | 28.3 | 0.12 | 5.6 | 6.7 | 31.1 | 0.10 |
| Abortion | 3.3 | 11.7 | 45.0 | 0.13 | 1.7 | 6.7 | 21.7 | 0.07 | 18.3 | 11.7 | 30.0 | 0.18 | 7.8 | 10.0 | 32.2 | 0.13 |
| Poisoning | - | 3.3 | 5.0 | 0.02 | - | 1.7 | 21.7 | 0.04 | - | 1.7 | - | 0.01 | - | 2.2 | 8.9 | 0.02 |

Index = sum of [ 3 for rank 1 + 2 for rank 2 + 1 for rank 3] for a particular cause divided by sum of [ 3 for rank 1 + 2 for rank 2 + 1 for rank 3] for all causes  in an agro ecology.

**Table 2:** Ranking of economically important goat diseases by small holder farmers in different agro ecologies of the study area (%)

| Goat Diseases | Lowland | | | | Midland | | | | Highland | | | | Overall | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Rank 1st | Rank 2nd | Rank 3rd | Index | Rank 1st | Rank 2nd | Rank 3rd | Index | Rank 1st | Rank 2nd | Rank 3rd | Index | Rank 1st | Rank 2nd | Rank 3rd | Index |
| Pest des Petit Ruminants (PPR) | 66.7 | 26.7 | 5.0 | **0.43** | 66.7 | 25.0 | 3.3 | **0.42** | 68.3 | 15.0 | 16.7 | **0.42** | 67.2 | 22.2 | 8.3 | **0.42** |
| Sheep& goat pox | 3.3 | 13.3 | 23.3 | **0.10** | 5.0 | 13.3 | 5.0 | **0.07** | 1.7 | 1.7 | - | **0.01** | 3.3 | 9.4 | 9.4 | **0.06** |
| Anthrax | 11.7 | 21.7 | 18.3 | **0.16** | 6.7 | 21.7 | 58.3 | **0.20** | 5.0 | 28.3 | 61.7 | **0.24** | 7.8 | 23.9 | 46.1 | **0.20** |
| pastuerellosis | 11.7 | 30.0 | 28.3 | **0.21** | 13.3 | 35.0 | 30.0 | **0.23** | 21.7 | 53.3 | 21.7 | **0.32** | 15.6 | 39.4 | 26.7 | **0.25** |
| LSD | 6.7 | 8.3 | 23.3 | **0.10** | - | 1.7 | 3.3 | **0.01** | - | - | - | **-** | 2.2 | 3.3 | 8.9 | **0.04** |
| External Parasite | - | - | 1.7 | **0.003** | 3.3 | 3.3 | - | **0.03** | - | 1.7 | - | **0.01** | 1.1 | 1.7 | 0.6 | **0.01** |
| (CBPP) | - | - | - | **-** | 5.0 | - | - | **0.03** | 3.3 | - | - | **0.02** | - | - | - | **0.01** |

Index = sum of [ 3 for rank 1 + 2 for rank 2 + 1 for rank 3] for a specific disease divided by sum of [ 3 for rank 1 + 2 for rank 2 + 1 for rank 3] for all diseases in an agro ecology.

**Goat Mortality and Abortion:** Mortality and abortion of goat has been presented in Table 3. The average mortality of breeding male (3.2) and female (3.15) in lowland agro ecology is significantly (P<0.05) higher than that in midland (0.55 and 0.70) and highland (0.22 and 0.42) areas in the last twelve months. The mortality rate of male and female kids post weaning were also significant (p<0.05) higher in lowland as compared to midland and lowland. This might be because farmers in mixed agriculture based production system (midland and highland) have better access to infrastructures like veterinary clinics, roads, information and better technical health and husbandry trainings than those in agro pastoral areas (lowland).

Pre-weaning mortality rate of male and female kids in the last 12 months were 2.1 and 2.5, respectively in lowland areas; whereas in midland it was 0.6 for male and 1.5 for female and in highland the corresponding pre-weaning mortality was 0.3 and 0.4 for male and female respectively. Mortality of kids in the current study is higher than that of Dhaba[10] who reported mortality of 0.39 in south western Ethiopia. Studies have shown that up to 47% of kids die before weaning in Ethiopia and 26.7% was recorded up to yearling.[14-16] A higher mortality was recorded per year in female (3.5) compared to male (3.18) regardless of agro ecologies. This could be because females are more vulnerable to stress due to competition, abortion, dystocia which is sex specific attribute and diseases due to improper management during pregnancy and parturition. Studies indicated that Female kids were more susceptible to disease than male, which is 67.5% and 32.5%, respectively.[16] Mortality is prominent in multiple births than in single as reported by 88.5% of the respondents which might be because of incapability of dams to nurse the multiple births. This observation is in agreement with the report of Wilson who reported that, death rate of twin lambs/kids was almost twice that of single.[17]

**Traditional health Treatments and Veterinary services:** There is a variation among farmers in practicing of treating the sick goats. The households residing in the highland, midland and lowland used medicines as prescribed by professionals from modern veterinary clinics to treat sick animals as responded by 41.7%, 55% and 36.7%, respectively. The percent of households that consults veterinarians to treat sick animals was 44.4%. The majority of the households (56.6%) indicated that, they used traditional medication practices such as herbs (43.9%), bleeding (1.1%), burn animals with hot iron (2.8%) and combination of different traditional practices (7.8%) to treat sick animals. Previous study indicates that majority (83.3%) of the respondents used traditional treatments to treat their sick animals.[18] Government clinics were the core sources of modern animal treatment center as responded by 93.3% of the livestock owners (Table 4). It was revealed that there are no private veterinary clinics; instead there were some informal drug retailer at a small shops designed for sales of other human goods. The livestock health controlling and handling mechanisms in the area were very weak and expose to huge socio-economic loss in terms of death, reduction in productive and reproductive performance of animals, aggravating disease transmission and incurring cost for purchase of un-prescribed drugs. Study in Somali region of eastern Ethiopian indicated

that animals' health is at worst situation by the fact that incidence of disease coupled with the scarcity of veterinary infrastructure facilities, manpower and shortage of chemotherapeutic drugs.[12, 19, 20]

**Distance to Veterinary clinics:** The distance covered to veterinary clinics in different agro ecological zones was indicated in Figure 2. Government veterinary clinics are the main service providers. However, the distance from the residence to the clinics is far. This study revealed that, accessibility to veterinary clinics means of transportation, poor roads and distance to veterinary clinics were important challenges in the treatment of sick animals on top of scarcity of professionals and chemotherapeutic drugs. Farmers (21.7%) in lowland and 6.7% in the midland areas traveled more than 10 km distance to reach government clinics. In general, 46.7% of the respondents travelled more than 1 km of distance in order to obtain veterinary services. This finding is in agreement with the observation of Teshager in western Ethiopia who reported average distance traveled to animal health services was 8.89±0.20Km ranging from 6-14 km.[18]
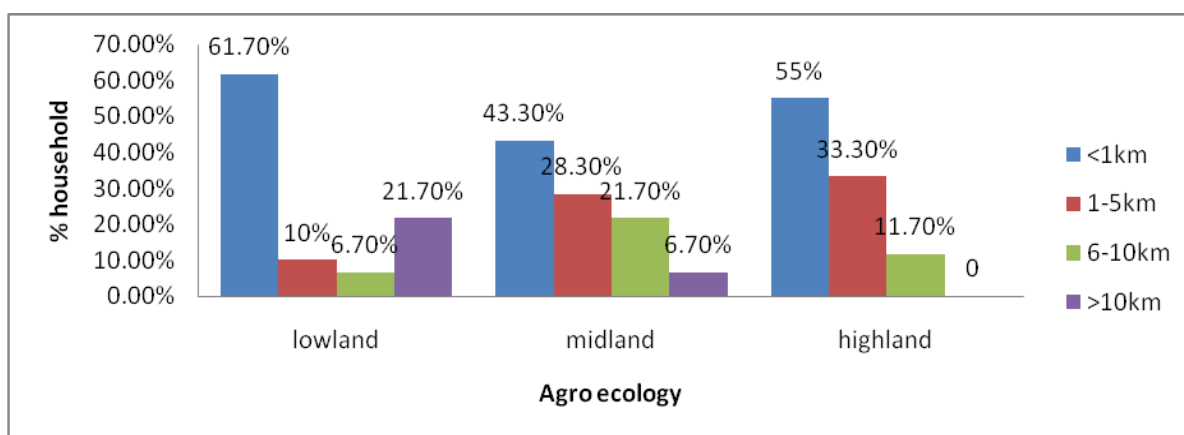


**Figure 2:** Distance of government veterinary clinics from Households in different agro ecology

**Table 3:** Mortality and abortion rate (%) of goat in the study area in a year time as recalled by farmers

| Mortality goat in the last 12 month | Lowland(n=60) | | Midland(n=60) | | Highland(n=60) | | Overall (N=180) | | sig |
|---|---|---|---|---|---|---|---|---|---|
| | Range | Mean ± SD | Range | Mean± SD | Range | Mean ± SD | Range | Mean± SD | |
| Young male 4-12m | 0-9 | 1.77±2.03[a] | 0-4 | 0.55±0.96[b] | 0-2 | 0.3±0.62[b] | 0-9 | 0.87±1.48 | 0.000 |
| Young female4-12m | 0-11 | 2.22±2.44[a] | 0-5 | 0.42±0.94[b] | 0-3 | 0.35±0.73[b] | 0-11 | 1±1.79 | 0.000 |
| Male ≥12 month | 0-23 | 3.2±4.02[a] | 0-6 | 0.55±1.78[b] | 0-4 | 0.22±0.74[b] | 0-23 | 1.3±2.8 | 0.000 |
| Female ≥12 month | 0-19 | 3.15±4.04[a] | 0-5 | 0.7±1.14[b] | 0-4 | 0.42±0.89[b] | 0-19 | 1.42±2.76 | 0.000 |
| Male < 4 month | 0-9 | 2.1±2.1[a] | 0-4 | 0.6±0.9[b] | 0-2 | 0.3±0.6[b] | 0-9 | 1.0±1.6 | 0.000 |
| Female < 4 months | 0-10 | 2.5±2.5[a] | 0-11 | 1.5±2.5[b] | 0-3 | 0.4±0.7[c] | 0-10 | 1.1±1.9 | 0.000 |
| Kid < 4m | 0-17 | 4.6±4.1[a] | 0-9 | 1.1±1.6[b] | 0-5 | 0.7±1.0[b] | 0-17 | 2.1±3.1 | 0.000 |
| Number of abortion in 12 month | 0-15 | 2.6±2.9[a] | 1-3 | 1.3±0.7[b] | 1-6 | 1.3±1.2[b] | 0-15 | 2.0±2.3 | 0.056 |
| Total male mortality | 0-24 | 6.0±5.1[a] | 0-10 | 1.7±1.85[b] | 0-4 | 0.8±0.93[b] | 0-24 | 3.18±3.74 | 0.000 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Total female mortality | 0-25 | 7.83±5.18[a] | 0-9 | 2.6±1.7 [b] | 0-4 | 1.17±1.14[c] | 0-25 | 3.5±3.82 | 0.000 |

[a,b,c] Superscripts with different letters across the rows differ significantly ($p<0.05$), N= Number of observation, SD= Standard Deviation; m= month

**Table 4:** Traditional treatment and veterinary services

| Factors | Low land | | Mid land | | High land | | Over all | |
|---|---|---|---|---|---|---|---|---|
| | N | % | N | % | N | % | N | % |
| **Availability of traditional treatments** | | | | | | | | |
| Herbs | 26 | 43.3 | 24 | 40.0 | 29 | 48.3 | 79 | 43.9 |
| Bleeding | 0 | 0.0 | 0 | 0.0 | 2 | 3.3 | 2 | 1.1 |
| Firing | 1 | 1.7 | 1 | 1.7 | 3 | 5.0 | 5 | 2.8 |
| Combination of all the above | 11 | 18.3 | 2 | 3.3 | 1 | 1.7 | 14 | 7.8 |
| No traditional treatments | 22 | 36.7 | 33 | 55.0 | 25 | 41.7 | 80 | 44.4 |
| **Sources of veterinary services** | | | | | | | | |
| Government | 50 | 83.3 | 58 | 96.7 | 60 | 100.0 | 168 | 93.3 |
| shop or market | 0 | 0.0 | 1 | 1.7 | 0 | 0.0 | 1 | 0.6 |
| no source of veterinary | 10 | 16.7 | 1 | 1.7 | 0 | 0.0 | 11 | 6.1 |

**Destocking:** The different reasons for culling goat are presented in Figure 3. The farmers cull their animals for a number of reasons. They are culling poor looking animals in performance or cull animals as a disease control mechanism. Productivity problems, disease, persistent poor body condition and synergetic effects of all these factors were the common top four reasons for destocking goat flock with proportions of 46.1%, 20.6%, 17.2% and 16.1%, respectively. Similar findings were reported in western Ethiopia.[10]
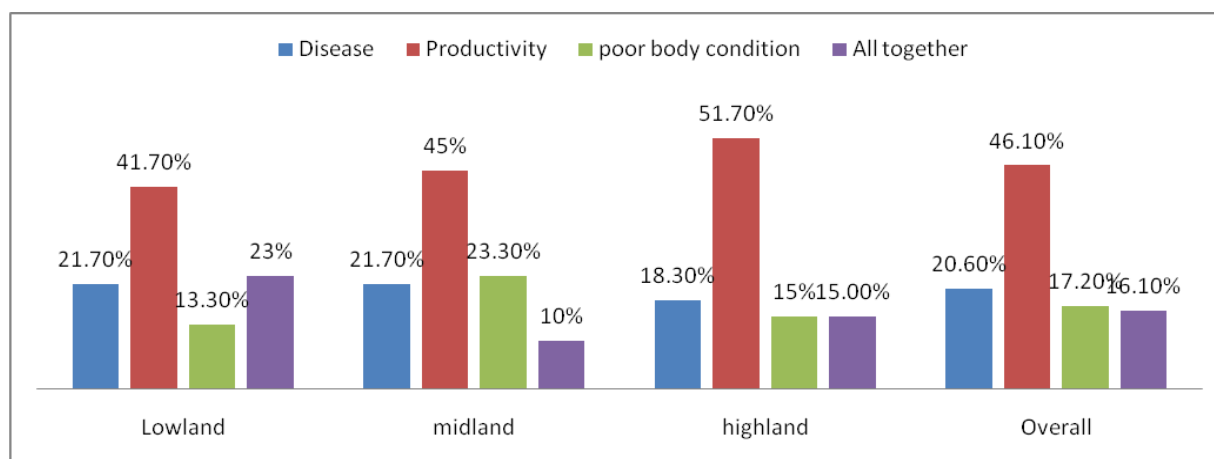


**Figure 3:** Reason of culling goats

## Conclusion

The result of this study revealed that diseases, abortion, predators, accident and poisoning by plants and snakes were the major causes of goat death. A viral disease Pest des Petit Ruminants, pastuerellosis and anthrax were the top three and highly prevalent diseases which affect productive and reproductive performance of goat that causes high economic loss. There was high kid and adult does mortality provoked by the absence of veterinary service, infrastructure, veterinarians and malnutrition. Majority of the goat keepers use different techniques of traditional medication to treat sick animals. The farmers travel longer distance to access and utilize the veterinary service. The situation has to be reverted through infrastructure development like clinics and roads, through

strengthening the extension service with inputs. There is also a need to training of livestock owners in all aspects of husbandry like feeding, housing, breeding, health management and bio-security.

## Acknowledgement

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