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# Smallholder Livestock Production System in Dandi District, Oromia Regional State, Central Ethiopia

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**Abstract:** A survey was conducted in Ginchi watershed area in Dandi district of Oromia Regional State, central Ethiopia. The objective of the study was to assess livestock production system, productive and reproductive performance of animals and to identify constraints to livestock production. Cross-sectional stratified random sampling technique was used to select and administer pre-tested, structured questionnaire to 78 randomly selected households. Data were collected and analyzed using descriptive statistics. The study revealed that mixed crop-livestock production system was found to be the dominant farming system in the study area. The average landholding/household was 2.5 ha. The average livestock holding per household was 4.53±0.4 cattle, 1.08±0.2 sheep, 0.54±0.2 goats, 0.1±0.04 horses, 0.1±0.04 mules, 0.6±0.09 donkeys and 3.04 poultry, respectively. In the study area, cattle are kept mainly for draught purposes. Small ruminants are used to generate income and meat production for household consumption. The major feed resources were natural pasture, hay, crop residues and crop-aftermath and tree/shrub fodders. Average milk production per cow/day was 1.76 liters. Average age at first calving, calving interval and lactation length (months) were reported to be 50.59 ± 6.93, 22.19±7.73 and 8.96±4.6, respectively. Respondents ranked feed shortage, diseases prevalence, labour scarcity and lack of capital as the major constraints limiting livestock production in that order of importance. Technical and institutional intervention would be very crucial to alleviate the prevailing constraints to livestock production in the study area.

**Key words:** Age at First Calving · Calving Interval · Constraint · Feed Resources · Ginchi

## INTRODUCTION

In Ethiopia, agriculture is the main economic activity and more than 80% of Ethiopian population is dependent on agriculture of which livestock play a very important role [1]. In Ethiopia, agriculture contributes to 47% of the country's GDP and to more than 80% of the export and employs over 85% of the population [1].

Livestock is an integral part of the agriculture and the contribution of live animals and their products to the agricultural economy accounts for 40%, excluding the values of draught power, manure and transport of people and products [2]. Livestock serve as sources of food, traction, manure, raw materials, investment, cash income, security, foreign exchange earnings and social and cultural identity.

Ethiopia holds the largest livestock population in Africa estimated at about 43.1 million heads of cattle, 23.6 million sheep, 18.6 million goats, 4.5 million donkeys, 1.7 million horses, 0.33 million mules, 34.2 million chicken and 4.9 million beehives [3]. Similarly, contributions of livestock to cash income of the smallholders accounts for up to 87% and, subsistence of some pastoral communities is entirely based on livestock and livestock products. Despite these roles, the productivity of livestock in general is low and compared to its huge resource its contribution to the national economy is below expected. Zegeye [4] indicated that feed shortage, poor genetic potential for productive traits, poor health care and management practices are the major contributors to the low productivity.

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Even though livestock plays a very significant role in the livelihood of smallholder farmers in the study area, livestock production system, productive and reproductive performance and constraints to livestock have not been studied. Thus, the objective of this study was to assess livestock production system, productive and reproductive performance of cattle and to identify major constraints limiting livestock production under smallholder farming systems in Dandi district.

## MATERIALS AND METHODS

**The Study Area:** The study was conducted in Dandi district of West Shewa zone of the Oromia Regional State, central Ethiopia. The area is located 90 km west of Addis Ababa at an altitude ranging from 2140-2800 m above sea level, with mean annual rainfall of 1140 mm and average daily temperature of 16.3°C. The soils are Pellic Vertisol, Vertic Cambisol and Nitosol Mitiku [5, 6]. The study area was stratified into three based on altitudinal ranges viz., Land type A (2140-2200 m.a.s.l.), Land type B (> 2200 - 2400 m.a.s.l.) and Land type C (> 2400-2800). Land types A, B and C represent low, medium and high altitudes, respectively. The majority (57%) of the population resides in land type C, whereas 28 and 13% resides in land types A and B, respectively.

**Sampling Procedure:** Cross-sectional stratified random sampling technique was used to obtain the sample households. First, the total number of households from each land type was obtained. A random sample of households from the population that were initially stratified by land types, a total sample size of 78 households, 55.1% from land type C (high altitude), 11.5% from land type B (middle altitude) and 33.3% from land type A (low altitude) were randomly selected with the help of ILRI field assistants based on the proportion of households in each land types. The number of household from each land type was determined using Proportional Probability to Size approach.

**Source of Data and Analytical Technique:** A single-visit-multiple subject formal survey technique [7] was used for data collection using a pre-tested, structured questionnaire. Before the questionnaire interview, group discussion was conducted with key informants of the community and experts from Agricultural Development Office of the district to have an overview of the general livestock production system. The questionnaire for the formal survey was developed using the information generated by the Participatory Rural Appraisal (PRA). The data collected were on socio-economic characteristics, landholding and land use system, ranking of livestock and crop production, livestock composition, feed resources and feeding systems, breeding system, milking practices, production and reproductive performance of livestock, housing system, gender division of labour for livestock husbandry and constraints to livestock production. The primary data was collected by enumerators of International Livestock Research Institute (ILRI) based at the study area under close supervision and participation of the author. The data was analyzed statistically using Statistical Package for Social Sciences (SPSS) software, version 10.09). It involved descriptive statistics such as mean, percentile and standard deviation for the different variables.

## RESULTS AND DISCUSSION

**Household Characteristics:** Socio-economic characteristics of household in the study area are shown in Table 1. The results of the analysis show that the mean family size was 5.6 members/household. The results also showed that 17.9, 3.8 and 10.3% had primary, junior secondary and secondary schools educational, respectively, whereas 25.6% of the respondents could read and write. Majority (42.3%) of the respondents had no formal education and thus farmers need to get basic education, for the reasons of adopting new technologies, education is an important factor which if lacking can negatively impact on future improved livestock production.

Table 1: Socio-economic characteristics of the respondents (n=78)

| Characteristics | Frequency | Percent |
|---|---|---|
| Occupation | | |
| Agriculture | 78 | 100.0 |
| Livestock production | | |
| Main activity | 0 | 0.0 |
| Secondary activity | 78 | 100.0 |
| Education | | |
| Illiterate | 33 | 42.3 |
| Read and write | 20 | 25.6 |
| Primary school | 14 | 17.9 |
| Junior secondary school | 3 | 3.8 |
| Senior secondary school | 8 | 10.3 |
| Average family size (person) | 78 | 5.6 |

n= number of respondents

**Farming System:** Mixed crop-livestock production system is the dominant farming system in the study area. Livestock production is subsistence-oriented and is an important component of the mixed farming system and is well integrated with crop production. Livestock species kept by the farmers comprise cattle, sheep, goats, equines and chicken. Cattle are the dominant species, mainly used for draught power, followed by milk and meat production, income and manure for fuel than for maintaining soil fertility. Livestock also have an important socio-cultural role in the study area.

Farmers practice a cereal dominated cropping system with teff (*Eragrostis teff*) as the most important crop in low and medium altitudes, followed by Chick pea, rough pea/grass pea and noug (*Guizotica abassynica*). In the high altitude, wheat is the most important crop followed by faba bean, barely, field pea and maize. At high altitude, the settler from the *Ghuraghe* area introduced enset (*Ensete ventricosum*) and is adapted by many farmers in the area. Ensete is used for both human food and livestock feed. The settlers from *Kambata* area introduced sugar cane (*Saccharum spp*.) now adapted by some farmers in study area. In all land types, the fields around homesteads are planted with maize, which is mainly consumed as green cob, the first harvest in the rain season. Other crops include production of some vegetables. A cash crop with increasing importance, which many farmers grow at back yard, is *Geeshoo* (*Rhamnus prinoides*) for preparation of local alcoholic drinks.

**Landholding and Land Use Pattern:** The overall average landholding per household in the study area was 2.5 hectare (ha) Table 2. However, the average land holding per household varied among land types of the study. Major proportion (63.2 %) of the land owned per household was used for crop production. Cropland holding varied from 0 to 8.5 ha. Hay and pastureland occupied 17.6 % of the total land owned and 28 % of the total cultivated land resulting in reduced grazing land. The average landholding reported in this study is smaller than the report of Zelalem [8] who observed 4.9 and 3.0 ha for Holeta and Sellale areas of central Ethiopia, respectively and comparable with 2.5ha for Debre Zeit per household. Beyene [9] reported that about 90% of the landholdings in the central highlands of Ethiopia are below 5ha and 65% are less than 1.5ha.

Table 2: Overall average landholding (ha) and landuse pattern per household (n=78)

| Category | Mean | Percent |
|---|---|---|
| Crop land | 1.58 | 63.20 |
| Grazing and hay | 0.44 | 17.60 |
| Forest land | 0.02 | 0.60 |
| Living quarter | 0.44 | 17.60 |
| Total | 2.50 | 100.00 |

n= number of respondents

Table 3: Frequency of ranking of farm activities in the study area (n=78)

| Rank of farm activities | Frequency | Percent |
|---|---|---|
| Crop>livestock | 65 | 83.3 |
| Crop>livestock>others | 7 | 9.0 |
| Livestock>crop | 2 | 2.6 |
| Crop>others | 2 | 2.6 |
| Others>livestock>crops | 1 | 1.3 |
| Crops>others>livestock | 1 | 1.3 |

n= number of respondents

**Ranking of the Relative Importance of Livestock and Crop Production:** In ranking farm activities, 83.3% of the farmers reported that crop production contributes more to their livelihood, whereas 2.6% indicated that the contribution of livestock to the family livelihood was higher than that of crops Table 3. About 1.3% of the respondents indicated that income from off-farm activities contributed more than that from livestock and crop production.

**Livestock Holding:** The herd structure and composition per household are shown in Table 4. The average livestock holding per household was 4.53±0.4 cattle, 1.08±0.2 sheep, 0.6±0.09 donkeys, 0.54±0.2 goats, 0.1±0.04 horses, 0.1±0.04 mules and 3.04 ±0.45 poultry, respectively. Cattle (66%) were the main species reared by the respondents and were used primarily for draught power (traction) and milk and meat as secondary interest. This is in line with ILCA [10]. There was no significant difference in cattle holding between the three land types. Out of the total cattle holding, oxen and milking cows accounted for 37 and 16 %, respectively. The higher number of oxen per household indicates their major importance for draught power. This is in agreement with reports of CSA [3] who indicated that out of the total cattle holding in mixed farming system, cows and oxen represented 42 and 40%, respectively.

**Source of Oxen and Cows:** About 25% of the oxen and 72.2 % of the cows owned by the households were reared on farm, whereas 38.1 % of the oxen and 27.8 % of the cows were purchased from market or other smallholders,

Table 4: Average (Mean ±SE) number of livestock per household in study area (n=78)

| Category | Land type A (n = 26) | Land type B (n = 9) | Land type C (n =43) | Overall mean |
|---|---|---|---|---|
| Cattle | 4.31±0.6[a] | 4.78±1.4[a] | 4.60±0.5[a] | 4.53±0.4 |
| Oxen | 1.35±0.2[a] | 1.56±0.5[bc] | 1.95±0.2[c] | 1.71±0.1 |
| Milking cows | 0.73±0.2[a] | 0.56±0.3[a] | 0.79±0.1[a] | 0.74±0.1 |
| Dry cows | 0.38±0.1[a] | 0.78±0.4[a] | 0.21±0.07[a] | 0.33±0.08 |
| Calves | 0.8±0.28[a] | 0.66±0.41[a] | 0.88±0.2[a] | 0.83±0.16 |
| Young bull | 0.54±0.2[a] | 0.56±0.4[a] | 0.37±0.1[a] | 0.45±0.09 |
| Young heifers | 0.50±0.1[a] | 0.67±0.3[a] | 0.40±0.09 [a] | 0.46±0.07 |
| Sheep | 0.73±0.4[a] | 0.56±0.56[a] | 1.40±0.3[a] | 1.08±0.2 |
| Goats | - | 3.22±1.2[a] | 0.30±0.2[b] | 0.54±0.2 |
| Donkey | 0.5±0.2[a] | 0.67±0.3[a] | 0.65±0.1[a] | 0.60±0.09 |
| Horse | 0.08±0.05[a] | 0.22±0.2[a] | 0.1±0.04[a] | 0.1±0.04 |
| Mule | 0.00±0.0[a] | 0.00±0.0[a] | 0.02±0.02[a] | 0.01±0.01 |
| Poultry | 3.42±0.8[a] | 4.1±1.3[a] | 2.58±0.59[a] | 3.04±0.45 |

Means within the same row with different superscripts are significantly different (P<0.05); n= number of respondents

Table 5: Frequency distribution (%) of sources of oxen and cows in the study area (n=78)

| Source | Oxen | Cows |
|---|---|---|
| Home reared | 25.4 | 72.2 |
| Purchased | 38.1 | 27.8 |
| Both reared and purchased | 36.5 | - |

n= number of respondents

Table 6: Reported feed resources and feeding system, method breeding and milking practices (n=78)

| Parameter | Percentage |
|---|---|
| Feed resources | |
| Natural pasture grazing | 100 |
| Crop residue | 100 |
| Hay | 79.49 |
| Stubble grazing | 100 |
| Concentrates | - |
| Improved forages | - |
| Feeding system | |
| Grazing | 100 |
| Stall feeding | - |
| Improved forage cultivation | |
| Farmers practicing | - |
| Farmers not practicing | 100 |
| Reasons for not cultivating improved forages | |
| Scarcity of land | 100 |
| Lack of awareness | 100 |
| Breeding system | |
| Natural | 100 |
| Artificial insemination | - |
| Milking system | |
| Hand milking | 100 |
| Machine milking | - |
| Frequency of milking | |
| Once a day | - |
| Twice a day | 100 |

n= number of respondents

respectively Table 5. About 36% of the oxen were both reared on farm and purchased. From results of this study, majority of the cows were reared on farm, while most of the oxen were purchased both from farmers and/or market.

**Feed Resources:** The major sources of feed for livestock in the study area were natural pasture grazing, crop residue, conserved hay, stubble grazing and non-conventional feeds Table 6. Natural pasture was the major feed resource for livestock feeding in the study area. This result is in line with the report of Seyoum *et al.* [11] in the high lands of Ethiopia. Mesfine [12] reported that grazing and browsing account for nearly 88 % of the total feed supply in Ethiopia.

Crop residues were the second most important feed resources for livestock followed by hay supplementation. *Teff* (*Eragrostis teff*) residue in low and medium altitudes and wheat crop residue in high altitude were the main crop residues used for livestock feed. Maize Stover is also reported to be utilized in September and October. During both dry and wet seasons oxen and milking cows had priority access to hay and crop residues supplementation. It was observed that all households (100%) did not cultivate improved forage species. The main reasons for not growing forage crops were scarcity of land and lack of awareness. It was observed that around homesteads of some households, there was Sesbania tree as life fence, but farmers did not feed to their animals because of lack of awareness. Supplementation of livestock with common salt is a common practice by all the respondents.

The respondents also indicated that oil seed by-products are available in the nearby *Ginchi* town, mainly noug (*Guizotica abassynica*) and linseed cakes, but only a few farmers used to supplement their animals due to

their high cost. The study revealed that feed shortage occurs in wet season due to water logging of the grazing pasture lands and intensive cropping. Similarly, Fekadu and Abrahamsen [13] reported that feed shortage was encountered in wet seasons in the southern Ethiopia due to limited grazing area as most of the available land was used for crop production. The dominant feeding system practiced in the study area was extensive grazing system.

Milking Management: Almost all the respondents (100%) indicated that for milking to take place calves have to suckle their dam for 2-3 minutes to stimulate milk let-down, otherwise it result in low milk yield. Milking is done exclusively by hand, with twice a day milking frequency. Milking is not done hygienically in which washing of udder before milking is not practiced, except wet season when it is muddy. For milk collection traditional milk containers, which are washed either with cold or warm water and smoked with some wood and herbs imparting a distinct flavour to the milk were used.

Breeding System: The study revealed that natural mating (100%) was the only system available for inseminating cows Table 6. Thus, the study suggests that there is a need to introduce artificial insemination service to increase the genetic merit of the herd to improve milk production. Crossbreeding will give an opportunity to the farmer to shift from subsistence milk production to marketing extra milk surplus of family consumption.

**Housing Management:** Most of the respondents (60%) provided nighttime shelter to their lactating and pregnant cows Table 7. About 76 and 14.9 % of the cows are housed in separate shed and share the home of the household, respectively. The rest, 2.1 and 6.4 % are kept in open enclosure and in corrals. It was observed that 2.2, 31.1 and 66.6 % of the calves were housed during night at corrals, separate shed and home of the household, respectively. About 60 % of the respondents housed sheep at night in separate pen and in family home (40 %). Of the goat owners, 11.1, 77.8 and 11.1 % shelter their goats at night at corrals, in separate pen and in home of household, respectively. Of the equine holders, 6.1 % housed at night at corrals, 72.7 % in separate shed and the rest 21.2 % households shelter in the living room of the households.

**Gender Involvement in Livestock Management:** Gender involvement in livestock management in the study area is shown in Table 8. The result showed that family labour was the major source of labour for livestock management. Accordingly, 76% of children were involved in herding and watering of livestock. When family labour is in short supply during pick cropping and harvesting activities and children attend school, hired labour (7.7%) and household head (14.7%) are responsible for herding and watering of livestock. About 89.8, 95.9% and 94.7% of

Table 7: Percentage distribution of housing types in the study area

| | | Type of housing | | | |
|---|---|---|---|---|---|
| Type of animal | n | Open | Corral | Separate shed | Family home |
| Lactating/pregnant cows | 47 | 2.1 | 6.4 | 76.6 | 14.9 |
| Calves | 45 | 0.0 | 2.2 | 31.1 | 66.7 |
| Other cattle | 66 | 1.5 | 7.6 | 69.7 | 21.2 |
| Sheep | 27 | 0.0 | 0.0 | 60.0 | 40.0 |
| Goats | 10 | 0.0 | 11.1 | 77.8 | 11.1 |
| Equines | 33 | 0.0 | 6.1 | 72.7 | 21.2 |

n = number of respondents

Table 8: Division of labour among family members as percentage of each activity (n=78)

| | Responsible family member (% of the total respondents) | | | | | | |
|---|---|---|---|---|---|---|---|
| Activity | Men | Female | Children | Hired labour | Men + children | Family | Female + children |
| Herding and watering | 14.7 | 1.3 | 76.0 | 7.7 | - | - | - |
| Water collection | 3.6 | 89.8 | 5.5 | - | - | - | 1.8 |
| Milking | | 95.9 | - | - | - | - | 4.1 |
| Shed cleaning | | 94.7 | 4.0 | - | - | - | 1.3 |
| Supplementary feeding | 71.4 | 1.4 | 5.7 | - | 14.3 | 7.1 | - |

n= number of respondents

Table 10: Farmers' strategies for overcoming labour shortage for herding and watering in the study area (n=26)

| Strategy | Percent |
|---|---|
| Hire labour | 50.0 |
| Borrow labour | 19.2 |
| Entrust or lending cattle to other people | 11.5 |
| Shifting to stall feeding | 3.8 |
| Herding by the household head | 11.5 |
| Hiring and borrowing labour | 3.8 |

Table 11: Average productive and reproductive[1] performance (month) of livestock in the study area as per the interviews

| Parameters | Mean±SD |
|---|---|
| Age at first calving | 50.59±6.69 |
| Lactation length | 8.96±4.63 |
| Milk yield (l/ cow/ day) | 1.76±0.89* |
| Calving interval | 22.19±7.73 |
| Age at first lambing | 12.64±5.29 |
| Lambing interval | 7.37±3.77 |
| Age at first kidding | 7.37±3.77 |
| Kidding interval | 6.56±1.42 |
| Age at first parturition, donkey | 45.33±13.52 |
| Parturition interval, donkey | 19.86±6.47 |
| Age at first parturition, horse | 35.25±18.30 |
| Parturition interval, horse | 18.0±6.0 |

[1]=Productivity estimates were based on the assessment of the interviewee; *= average milk yield above calf off-take

household wife were involved in water collection, milking and shed cleaning, respectively. Milk processing and marketing of cottage cheese and butter was done by household wife. About 71.4% men are responsible for supplementing hay and crop residues to animals.

**Labour Problem and Coping Mechanism:** The result showed that 38.3 % respondents had shortage of labour for herding and watering from June to January (50 %), during cropping season, when the family labour is occupied with land preparation, seeding, weeding, harvesting and threshing. The strategies used to cope with labour shortage were hiring labour (50%) and borrowing labour (19.2%) Table 10. About 11.5% of the respondents entrust their animals to other farmers. Entrusting cattle deprives the owner from access to products from cattle, particularly milk and milk products. Few respondents (3.8%) shift from grazing to stall feeding when they face labour shortage for herding and watering.

**Productive and Reproductive Performance of Cattle:** The reported productive and reproductive performance of cattle and other animals are shown in Table 11.

**Age at First Calving (AFC) and Calving Interval (CI):** In the present study, the mean AFC and CI were 50.59±6.94 and 22.19±7.73 months, respectively. The mean AFC reported in this study was higher than that of Kassa-Mersha and Arnanson [14] who reported that for indigenous Boran cows the mean age at first calving was 41.5 months, with a range of 24.3 to 63.4 months. The long calving interval in the current study might be an indication of the poor nutritional and management status of cattle under smallholder farmers. Mukassa-Mugerwa *et al*. [15] reported an average calving interval of 26 months for indigenous cattle. Fekadu and Abrahamsen [13] reported calving interval of 19 months in the southern Ethiopia. Zelalem [8] reported average calving interval of 480 and 497 days for local and crossbred cows, respectively. Kiwuwa *et al*. [16] and Mekonnen and Goshu [17] reported calving interval of 445 and 447 days for indigenous cows, respectively.

**Milk Production:** The mean daily milk production observed in this study was 1.76±0.89 litres per cow and was higher than that of CSA [3]. Zelalem [8] reported that average daily milk yield per cow was 2.9 1iters in Holetta and the high milk yield for Holetta could be due to the relatively more number of crossbred cows.

**Lactation Milk Yield:** In this study, the average milk yield per cow per lactation and lactation length were 473.09 litres and 8.96±4.63 months. The mean lactation length reported in this study was higher than that of CSA [3], which was 5 to 7 months. Zelalem [8] reported 11.33 months for average lactation length in central Ethiopia. Mukassa-Mugerwa *et al*. [15] reported that around Debre Zeit on average cows produced 524 liter of milk in a 239 days lactation period. Under experimental conditions, adequately fed and well managed zebu cows were able to yield 500 to 600 l of milk per lactation [9].

**Reproductive Performance of Goats and Sheep and Equines:** The mean age at first lambing and lambing interval of sheep were 12.64±5.29 and 7.37±0.77 months, respectively. The mean age at first kidding and kidding interval of goat was 10.90±3.14 and 6.56±1.42, months respectively. According to Belete [18] age at first parturition of goats and sheep within the Borana rangelands was 16.8 and 18 months, respectively and was longer than the results of this study. The mean age at first parturition of horse and donkey were reported to be 35.25±18.30 and 45.33±13.52 months, respectively, with average parturition interval of 18±6 and 19.86±6.47 months for horse and donkey, respectively.

Table 12: Ranking of the major constraints (%) to livestock production as identified by farmers (n=78)

| | | | Priority with votes and ranks | | | | |
|---|---|---|---|---|---|---|---|
| Problem | Frequency | Percent | 1 | 2 | 3 | 4 | Rank |
| Capital and animal health | 5 | 6.4 | 61(75.2*) | 6(9.8 %) | - | - | 1 |
| Feed shortage | 11 | 14.1 | 4 (5.1 ) | 39(50 %) | 10(38.5 %) | 2(40 %) | 2 |
| Health | 2 | 2.6 | - | 8(13.1 %) | 14(53.8 %) | 1(20 %) | 3 |
| Lobour scarcity | - | - | 13(16.7 %) | 8(13.1 %) | 2(7.7 %) | 2(40 %) | 4 |
| Capital | 4 | 5.1 | | | | | |
| Feed and health | 27 | 34.6 | | | | | |
| Feed, health and Capital | 11 | 14.1 | | | | | |
| Feed, health, labour and Capital | 3 | 3.8 | | | | | |
| Labour and capital | 1 | 1.3 | | | | | |
| Feed, health and labour | 14 | 17.9 | | | | | |
| Total | 78 | 100.0 | 78(100%) | 61(100%) | 26(100%) | 5(100%) | |

**Constraints to Livestock Production:** The major constraints limiting livestock production in the study area were feed shortage, animal health, labour scarcity and lack of capital Table 12. Shortage of feed was indicated as the first most important constraint for livestock production followed by animal health.

## CONCLUSION

Results of the study show that mixed crop-livestock production system was the dominant farming system in the study area. Livestock serves as a source of draught power, food, source of income and manure. Milk production and reproductive performance of livestock was generally low. Feed shortage, diseases and parasites, labour scarcity and lack of capital were the major constraints limiting livestock production. Feed availability in quantity and quality was ranked the first most important problem limiting livestock production. Based on the results of this study, the following recommendations are forwarded for improving livestock development in the study area.

- The scarcity of feed supply would be tackled through integrating improved forage crops into the cropping system and sustainable conservation, proper storage and utilization of hay and crop residues.
- Provision of artificial insemination services for cross breeding the local cows with exotic breeds that are adapted to the climate of the area.
- Provision of strong extension services and training on improved forage cultivation and livestock production and management practices is needed.
- Improved veterinary services and care should be strengthened.
- Access to credit services for purchase of improved genotypes and quality feeds is important.

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