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Assessment of Small Ruminant Management Practices in Jijiga and Shinile Zones of Somali Regional State, Ethiopia

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ABSTRACT

A survey was conducted to assess sheep and goat management practices in Jijiga and Shinile zones of Somali Region, eastern Ethiopia from November to December 2004. Information on sheep and goat ownership patterns, production objectives, and management and production constraints were collected from 360 households using semi structured questionnaires. The mean number of sheep and goats per household were 8.76±0.5 and 7.94±0.5 in Jijiga zone and 11.12±1.0 and 10.08±0.8 in Shinile zone. About 56% of the respondents kept sheep and goats for both local and oversea markets, whereas 43.1% of them reared their sheep only for local market alone. About 58% of the pastoralists bred their animals during wet season. Home-grown forage production was not a common practice in the areas and the pastoralists totally depended on natural pasture as source of feed for ruminants. About 63% of the interviewed pastoralists used natural mineral soil while 31% used both Carro and common salt. With regard to housing, about 85% of the respondents housed sheep in the open kraal at night. Shortage of feed and water, especially during drought period was found to be the major constraint to sheep and goat production due to which the highest death was reported.

Key words: sheep and goat management, Ethiopia

INTRODUCTION

Sheep and goats are widely distributed in Africa. Nuru (1987) estimated that there were 171 million sheep and 144.7 million goats in Africa. Ethiopia is endowed with large small ruminant population in Africa. According to the Ministry of Economics Development and Cooperation, (MEDaC) (1999), in 1993/94 there were 27.5 million sheep and 19.8 million goats in the country. Sheep and goats represent the largest proportion of the livestock population of Somali region. As stated by Somali Regional Pastoral and Agro-Pastoral Research Institute (SoRPARI) (2003), the Somali region possessed 17.6 million sheep and goats which represented about 32.4 % of the national resource. Out of this, there were about 1.316 million sheep and 548,000 goats in Jijiga zone, 913,000 sheep and 776,000 goats in Shinile zone. According to the Industrial Project Service (IPS) (2000) report, sheep and goats shared 74.6% (sheep 38.4% and goats 36.2%) of the total livestock population in the region.

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Small ruminant production is an essential feature of the farming system in Jijiga and Shinile zones of Somali region. It plays significant roles, in nutrition and food supply as well as household cash income. According to Agyemeang *et al*. (1985), 40% of the total incomes of small holder farmers comes from the sale of sheep and goat. Moreover, Gryseels and Anderson (1983), Bayer (1984), Seyoum (1992), Girma (1999), Jaitner (2001), reported that small ruminants provided continuous services to the economic stability and effective operation of crop production system. Djajanegara *et al*. (1996) reported that the role of small ruminants in general was extremely important within most farming system, as they had the potential of accumulating capital. In addition, Peacock (1983) reported that small ruminant were relatively easy to own by resource poor farmers especially women as they reproduced very fast and were raised in a wide range of production systems. However, the production in terms of mutton, milk and the reproduction (fertility) potential of these animals were extremely low. Girma (1999) indicated that Black Head Somali (BHS) sheep showed conception rates of 80% and most of the ewes gave birth only once per year. Kassahun *et al.* (1989) and Girma, (1999) reported that BHS had twining rates of less than 5%. Reports by FARM AFRICA (1996) also showed that about 97% of the Somali goats mainly gave birth to single kids, a twining rate of only 3%.

Different reports (Alemu, 1981; Adugna, 1990) indicated that there was a limited knowledge on livestock management practices, available feed resources and objectives of livestock rearing in Ethiopia. Although Somali region has a large resource of small ruminants documented information on the management practices and constraints of small ruminants production is scarce. Therefore, this study was designed to investigate the current sheep and goat management practices and constraints of sheep and goat production in Jijiga and Shinile zones of Somali Regional State.

MATERIALS AND METHODS

Description of the study area

This study was conducted in Jijiga and Shinile zones of Somali Regional State, Ethiopia, in 2004. Geographically, the study areas lie between 8^0 44′ N to 11^0 00′ N latitude and 40^0 22′ E to 44^0 00′ E longitude. The altitude of the zones ranges from 500 to 1650 meter above sea level. The mean minimum and maximum temperature ranges from 16-20 °C and 28-38 °C, respectively National Meteorological Services Agency (NMSA) (2004). According to International Center for Development Oriented Research in Agriculture (ICRA) (1997) Jijiga zone has a bimodal rainfall from March to May and from July to mid October. But, Shinile zone is characterized by a unimodal type of rainfall which falls during the months of June to September (IPS, 2000). The rainfall distribution is very erratic in both zones. The mean annual rainfall in Jijiga zone ranges from 600 to 700 mm, while in Shinile zone it ranges from 300 to 500 mm (Milkessa and Kurtu, 1997). Agro-pastoralism is the dominant production system in Jijiga zone while pastoralism dominates in Shinile zone (Holt, 1995).

Sampling technique

Based on the human population of the two zones, proportional numbers of household (240 from Jijijga and 120 from Shinile zone) were selected. These were systematically selected from two districts of Jijiga zone and one district of Shinile zone. The criteria for selection of the districts included accessibility for transportation, agro-ecological conditions and the number of sheep in the district. Semi-structured questionnaires and formal interviews were used to gather information from the selected households. Information on traditional livestock management practices, market opportunity, disease occurrence, causes of livestock mortality, importance and prospects of sheep production and

production constraints were gathered. Group discussions were also made with elder and clan leaders of the areas. In addition, information on certain events was gathered based on personal observation and field evaluation.

Data analysis

Data were analyzed using general linear model and multivariate analysis procedures of Statistical Procedure for Social Sciences (SPSS) (1999). Proportion of response to a particular variable was determined using descriptive statistics.

RESULTS AND DISCUSSIONS

Purpose of small ruminant production

The purpose of sheep and goat production in Jijiga and Shinile zones is given in Table 1. About 66.7 and 31.3% of the respondents in Shinile and Jijiga zones, respectively stated that they reared their sheep and goat for local market. Most of the pastoralists (67.9%) in Jijiga zone reared small ruminants for local and export market as compared to the pastoralists in Shinile zone (33.3%). This was due to more proximity of the zone to market outlet than Shinile zone. Pastoralists in Jijiga zone appeared to be beneficiary from both local and export earnings from sheep and goat production. The overall result revealed that 56.4% of the respondents reared sheep for both local and oversea markets, whereas 43.1% of them reared their sheep only for local market. In both zones, the pastoralists seemed to have an export oriented production objective. This was in agreement with the works of Nega *et al*. (1998) which reported that pastoralists in the southeast Somali region were engaged in sheep and goat rearing mainly for export market.

Ownership of small ruminants

All the interviewed pastoralists in the study areas owned either sheep or goat or both. In all cases, only local breeds of sheep and goat were reared. Besides, sheep and goat the respondents also kept cattle and camel. Sheep and goat ownership pattern in the study area is given in Table 2. Higher number of sheep (11.12) and goats (10.8) per household were observed in Shinile zone as compared to 8.76 heads of sheep and 7.94 heads of goats in Jijiga zone. The number of sheep and goats owned by the households in Shinile zone was significantly ($p<0.05$) greater than that of the households in Jijiga zone. The relatively smaller household ownership of small ruminants in Jijiga zone might be due to the limitation of grazing lands

Table 1 Distribution of households according to the objectives of sheep and goat production in the study areas.

Types of market	Percent of households		
	Jijiga	Shinile	Overall
Local market	31.3	66.7	43.1
Export market	0.8	-	0.5
Local and export	67.9	33.3	56.4

Table 2 Least square means ± Standard Error for number of sheep and goat owned per household.

Locations	Sheep	Goats
Jijiga	8.76 ± 0.5	7.94 ± 0.5
Shinile	11.12 ± 1.0	10.08 ± 0.9
Overall	9.56 ± 0.5	8.64 ± 0.5

as there was agro-pastoral production system whereby pastoralists were engaged in crop production besides livestock rearing. The average flock size observed in this study was higher than what was reported by Sisay and Belaineh (1997) for Jijiga area. The difference might be due to the fact that the flock size varied with seasons and years.

Sheep and goat breeding practice

Percentages of household according to the season that they bred their sheep and goat are given in Table 3. Nearly 82 % of the respondents in Shinile zone and 46% of those in Jijiga zone replied that they bred their sheep and goat during the wet season, while 15 and 18.3% of the respondents in Jijiga and Shinile zone, respectively bred their animals during dry season. About 39% of the respondents in Jijiga zone bred their animals all year round. But this kind of breeding management is not practiced in Shinile zone. In the former case due to the shortage of the grazing land, sheep and goats of both sexes were allowed to graze together all year round as a result of which breeding was uncontrolled. Similar breeding practice was reported by Agyemeang *et al*. (1985) in the highland area of Deber Berhan, Ethiopia. Pastoralists highlighted a number of problems related to this practice. This was in contrary to the works of ICRA (1997) and Girma (1999) which controlled breeding was reported to be a common practice in the southeastern Somali region and in Jijiga zone.

Pastoralists expressed that during mating period they used one ram for 30 to 50 breeding ewes. But the number of sheep and goats per household in the study area was so few and that respondents did not have shortage of rams/bucks for breeding. Those pastoralists who didn't have male animals for mating, allowed their ewes to stay with rams/bucks of their neighbors or their relatives. With regard to the ratio of ram to ewe, the result of this survey was in agreement with the works of Devendera and Mdleroy (1982), Doney *et al*. (1982) and Carles (1983) which respectively reported 1:50, 1:30 to 50 and 1:10 to 20 for tropical sheep under extensive conditions. On the other hand, Girma (1999) reported that the number of ewes that could be mated by one ram was high in the southeast lowlands of Somali region, being normally as high as 100 to 150**,** but reaching up to 200 in extreme cases.

Herding and housing

The major type of herding management in the surveyed areas was free grazing. All the interviewed pastoralists replied that they herded their sheep and goat together with cattle. Yitaye *et al*. (2000) reported that during the day, small ruminants were herded together with the other species. As children were the main source of labor for herding, there was no labor shortage in the study areas. Distribution of households according to their sheep and goat housing system is given in Table 4. Approximately, 79 and 96% of the respondents in Jijiga and Shinile zone, respectively housed their sheep and goats in the open kraal at night together with the other species of animals**.** Housing usually comprised an enclosed shed attached to or separated from the owner's residence. Shed walls were made of combination of sticks, spineless cactus and branches of acacia.

Table 3 Distribution of households (%) according to the season they bred their sheep.

Seasons	Percent of households		
	Jijiga	Shinile	Overall
Wet season	45.8	81.7	57.8
Dry season	15.0	18.3	16.1
All year round	39.2	-	26.1

In Shinile zone, most of the pastoralists were moving from place to place in search of feed and water. Due to this fact, human residences and shades were not permanent. In Jijiga zone pastoralists used permanent houses for sheep and goats around their homestead.

Pastoralists expressed that pregnant sheep and goats, new born lambs and kids were housed separately at night but joined the flock in the morning for grazing. In all cases, the young stocks were kept in small isolated and protected shades. Both newborn lambs and the older sheep and goats were given special treatment. The present result was in agreement with the survey results reported by Workneh (1992) and Alemayehu (1993) for the southeast lowlands where open pens were used commonly and goats were protected from cold and hot weather.

Feed resources and feeding

Distribution of households according to the types of feed resources used during the wet and dry seasons is summarized in Table 5. Most of the respondents stated that the native pasture from the communal rangeland was the main source of feed for their animals. In wet season, about 90.0% of the respondents in each of the two zones used native pasture, while during dry season 85.8 and 63.3% of the respondents in Shinile and Jijiga, respectively used natural pastures.

Crop residues were the only feeds used as supplements by pastoralists in Jijiga zone. During the wet and dry seasons in Shinile zone, 9.1 and 14.2% of the respondents, respectively used natural pasture plus crop residues. Similarly, a survey conducted by Sisay and Belainhe (1997) showed that the major source of animal feed was

Table 4 Distribution of households according to their small ruminant housing systems and places of shade.

Housings /places	Percent of households		
	Jijiga	Shinile	Overall
Types			
Open kraal without shelter	79.2	95.8	84.7
In a house or shelter	20.8	4.2	15.3
Places of shade			
Separate from the house	67.9	96.7	77.5
Adjoining the house	32.1	3.3	22.5

Table 5 Distribution of households according to the feed resources used during wet and dry seasons.

Seasons	Feed sources	Percent of households		
		Jijiga	Shinile	Overall
Wet				
	Native pasture	89.4	90.9	90.0
	Crop residue	3.3	-	2.2
	Native pasture plus crop residue	7.3	9.1	7.8
Dry				
	Native pasture	63.3	85.8	70.8
	Crop residue	8.4	-	5.5
	Native pasture plus crop residue	28.3	14.2	23.6

grazing with only few proportions of the pastoralists using crop residues, hay, grains and minerals as supplement during some periods of the year. Most of pastoralists in Jijiga zone stated that they experienced the shortage of animal feeds during the dry season while few of them replied that they usually faced the feed shortage during both seasons. The most critical months were from November to April when virtually pastures could not carry the animals. This was due to the shortage of rainfall and the expansion of crop and ground nut production which minimized the land available for grazing. In Shinile zone, all respondents stated that due to the shortage of the feed during both seasons, pastoralists either migrated to the high land areas or travelled to the main river valleys usually starting in November. This was in agreement with the works done by ICRA (1997) which it was that during the dry season only male members of the pastoralists families moved with their stocks in search of water and pasture. In all study sites, homegrown forage production was not a common practice. Moreover, contribution of agro-industrial by products was not existent in the study area.

Mineral nutrition

Types**,** seasons, forms and frequencies of supplementation of sheep and goats with different mineral sources are presented in Table 6. In the entire study area, 86% of the pastoralists in Shinile zone and 51% in Jijiga zone were found to use Carro soil. This was due to the financial limitation or the unavailability of the common salt in Shinile markets. Some pastoralists in Jijiga zone (8%) used salt as the survey site had access to market places from where pastoralists could purchase the salt easily. Mohammed *et al*. (1989) and Workneh (1992) reported that in Arsi and the southeast Borena lowland, the importance of providing mineral soils was well recognized. Considerable amount of the natural mineral soil can be used since it is freely and easily obtainable as compared to the commercial mineral mix which is not available in the region. More than two thirds of the pastoralists in Jijiga and almost all pastoralists

Table 6 Types**,** seasons, forms and frequencies of mineral sources supplementation for sheep and goat in Jijiga and Shinile zones.

Variables	Percent of households:		
	Jijiga	Shinile	Overall
Types of minerals			
Carro	51	86	63
Salt	8	-	6
Carro & salt	41	14	31
Not use	1.2	-	0.8
Seasons of supplementation			
Dry season	69	99	79
Wet season	0.8	0.8	0.3
All year	30	-	20
Forms of supplementation			
Mineral block	1.3	13	5
Powder/dust	80	81	80
Mixed with water	19	5.8	14
Frequencies of mineral collection/ year	3	2	2.6
Average distance, km	16.4	58	37.2

in Shinile zone used mineral supplements only during the dry season. Pastoralists explained that sheep could obtain sufficient minerals from available feeds and water during the wet season. In this aspect, pastoralist perception was in agreement with what McDowell (1997) reported. The author stated that as tropical forages contained less mineral during the dry season, it was logical to assume that grazing livestock most likely suffer mineral inadequacies during this time.

In the entire study area, it could be seen that 79% of the respondents used the mineral soil only during the dry season or whenever animals showed certain unusual physical changes and in feed intake, while 20 % of the respondents used minerals all year round. Gatenby (1986) reported that as the dry season proceeded, the nutritive value of vegetation fell, its fiber content increased and its digestibility, metabolic energy value, protein content and mineral content fell. In addition, McDowell *et al*. (1983) reported that during the dry season, inadequate protein and energy resulted in animals losing weight which lowed mineral requirements.

Regarding the supplementation practices, 81 and 80% of the respondents in Shinile and Jijiga zones, respectively stated that they fed the soil in powder form, while 5.8 and 19% of the respondents in the respective zones, fed them by mixing with water. The latter feeding method was easier to provide and the animals were forced to take both minerals and water at a time. About 13 % of the respondents in Shinile zone fed the minerals in the form of blocks. In this case, as pastoralists move from place to place in search of feed and water, the method may help them to carry the soil as blocks. According to the respondents, the frequencies of the mineral collection ranged from an average of almost three times in Jijiga to two times in Shinile zone with an overall mean of 2.6 times a year. This was in agreement with Mohammed *et al.* (1989) who observed that the animals might trek long distances to reach lake soils. In contrary, Girma (1999) reported that in the Harshin district of Somali region, the mineral soil was provided to the sheep and goats at 3 to 6 months intervals. There was significant difference ($P<0.05$) among the zones in terms of their distance from mineral collection sites. Average distance of mineral soil site from homesteads ranged from 16.4 km in Jijiga zone to 58 km in Shinile zone. Pastoralists in Jijiga zone collected minerals more frequently than those in Shinile zone. This was due to the fact that there were more than two mineral sites (Arabi and Dadi, etc.) in Jijiga zone.

Watering

Least square means for the average distance of residents from watering points and for frequency of watering are presented in Table 7. There was significant difference ($P<0.05$) between the two zones in distance of watering points from home-stead. Pastoralists in Shinile zone traveled longer distance (7.59 km) than those in Jijiga zone who traveled only 6.06 km in single trip. On the contrary, the survey conducted by Girma (1999) indicated that the distance covered to reach the watering points was as long as 20-40 km. Another study by IPS (2000) indicated that the distance from residential areas to watering points varied from 2 to 70 km, and this had significant influences on the frequency of watering.

Table 7 Least square means (Mean ± standard error) for distance of watering points and watering frequency.

Locations	Distance (km)	Frequency(days)
Jijiga	6.06 ±0.2	1.64 ± 0.5
Shinile	7.59 ± 0.3	1.90 ± 0.1
Overall	6.82 ± 0.2	1.73 ± 0.4

In this study, sheep and goats in the two zones were watered nearly at the same interval. However, pastoralists in Shinile zone provided water to their animals relatively less frequently than those in Jijiga zone. The watering frequencies observed in this study were slightly at variance with what was reported by Zinash, *et al*. (2002). According to the authors in many parts of the country, animals were trekked to distant watering points once in two or three days. Zewdu (1991) found that Black Head Somali sheep were watered once every three days. On the contrary, Girma, (1999) reported that in Harshin lowlands watering frequency reached as long as 10 days. Another study by IPS (2000) in the lowlands of Somali region, small ruminants and cattle were watered every 2-6 days.

Distribution of households according to time and methods of water provision is indicated in Table 8. Nearly 81.3% of the respondents in Jijiga and 100% of those in Shinile trekked their sheep to watering points. In Shinile 45.8 % of the respondents watered their sheep in the late afternoon, whereas in Jijiga zones 74.2% of the respondents watered their animals at noon. They trekked their sheep and goats to water sources during the midday where the temperature became high and the animals became thirsty so that they drank a lot of water. Georgievskii, *et al*. (1982) indicated that when daily temperature of the animal increased the loss of water through the skin and lungs became important as a result of which the animals became thirsty. Zinash, *et al* (2002) reported that water consumption increased with increases in dry matter intake and temperature. Carles (1983) indicated that insufficient water principally depressed the appetite of the animals and could seriously affect the ability of the animals to adapt to heat stress.

Sheep marketing

Reasons of sheep and goat selling in the study area are presented in Table 9. Fifty nine and forty four percents of the interviewed pastoralists in Jijiga and Shinile zone, respectively sold their sheep and goats when they faced cash problem

Table 8 Distribution of households according to time and method of water provision.

Methods/ time	Percent of households		
	Jijiga	Shinile	Overall
Method			
Trekking	81.3	100	87.5
At home	7.5	-	5.0
Trekking & at home	11.2	-	7.5
Time			
Morning	21.3	22.5	21.3
Midday	74.2	31.7	60.0
Late afternoon	4.6	45.8	18.3

Table 9 Reasons of sheep and goat selling in the study area.

Causes	Percent households		
	Jijiga	Shinile	Overall
Cash need	59.2	44.1	54.0
Disease out break	12.5	29.2	18.0
Religious festival	28.3	26.7	28.0

for purchasing food items and medicines. They were also sold any time when the owners faced cash problem and during severe feed shortages. Agyemeang *et al.* (1985) reported that animals were usually sold during the period between planting and harvesting in order to raise cash to buy the food for the family**.** Moreover, 28.3% pastoralists in Jijiga and 26.7% in Shinile zone sold their sheep during religious festivals. Religious festivals are among the special holidays that most of the urban and rural dwellers celebrate. This finding was in agreement with that of Yitay *et al.* (2000), which sheep and goats were found to be sold mostly during holidays.

In both study areas, the respondents indicated that selling of sheep was usually undertaken through middlemen (brokers) who bought and in turn sold to the others at a profit. The broker's role is to match the buyer with a seller and to insure the legitimacy of the sale. The middlemen charge Birr 5.00 from each of the buyer and the seller. Tegene *et al.* (1999) also observed similar selling and buying agreements, but the maximum amount of money paid to the broker per sheep/goat bought and sold was Birr 5.00 and 10.00, respectively. All respondents stated that weight scale was not used for selling the animals. Visual assessment was one of the methods used to estimate the size and the condition of a sheep/goat and hence its price. Buyers may also palpate around the rump and chest to estimate the prices. This result was in agreement with the work done by Christopher (2004) that livestock were sold by general appearance and not by weight. As a result, animals of the same weight are likely to attract different prices. In certain cases the animals are given as gifts for marriage, and funerals ceremonies.

Sheep and goat disease and mortality

In all the study areas the provided veterinary services were only for vaccination and some therapeutic treatments against a few common diseases like anthrax, pasteruellosis, and sheep pox. This was in agreement with the findings of a survey works conducted by Girma (1999) and Alemayehu (1993). Pastoralists in the study areas reported that the most common diseases that affected small ruminants were pneumonia, anthrax, foot rot, sheep pox and diarrhea. Ticks and mange mites were also serious problems. Causes of sheep mortality and percentage of death by age category are shown in Table 10**.** In Shinile zone, 65.7% household respondents reported that the highest death of the animals was found due to the drought when there was severe shortage of feed and water. In this zone, the livestock were affected by frequent drought and shortage of water. However, in Jijiga zone, as reported by 45.1% and 30.2% of household respondents, the predators

Table 10 Distribution of households (%) according to causes of sheep and goat mortality and age of mortality

Cause	Percent of households		
	Jijiga	Shinile	Overall
Causes			
Drought,	24.7	65.7	38.3
Disease out break	30.2	25.3	28.6
Predators	45.1	9.0	33.1
Age of mortality			
Lambs (< 1 year)	51.3	68.3	57.0
Yearlings (1year)	37.5	20.0	32.0
Above yearlings	11.1	11.7	11.0

followed by disease outbreak were the major causes of the animal mortality. As explained by the respondents, the major contributory factors were the high population of hyenas and foxes in the study area.

With regard to age of mortality, 68.3% and 51.3% of the respondents in Shinile and Jijiga zones, respectively reported that lambs mortality occurred at the age of below one year. Mortality rates of ewes were less severe than those of lambs and yearlings. After reaching two years of age, sheep and goats had relatively low rate of mortality. The present finding was in line with Wilson (1982) who reported that the higher mortality rate was found in lamb (10% per year) compared to that of adult animals.

Major constraints to small ruminant production

Low productivity and various diseases were the major constraints that faced sheep and goat production in the areas. Due to poor veterinary services, the livestock in general, sheep and goat in particular were highly affected by certain diseases. Inadequate nutrient intake by the animals aggravated the situation. Small ruminants in the study areas survived entirely on natural grasses. These unimproved grasses were low in nutritional value, mineral content and their quality normally deteriorated especially during dry seasons. Shortage of grazing land, poor soil fertility, deterioration of natural resource and unreliable rainfall were the main factors contributing to the deficiencies of feed supply in the areas. In all study areas, utilization of agro-industrial by products and cultivated forage was not common. Pastoralists also identified shortage of drinking water as the major problem for their animals. Livestock depend on rain water during the wet season and seek a permanent water source during the dry season. Another constraint of small ruminant production in the areas is the lack of consistent marketing of the animal. Lack of adequate financial resources and the absence of credit services were also obstacles for improving the livestock production in the survey area. As the financial resources and credit services were not available in these areas, pastoralists could not even replace their animals when they died due to drought and predators.

CONCLUSIONS

To bring a sustainable livestock development in the area, the concerned institutions should work together on improvement of traditional production systems through the promotion of fattening schemes, artificial inseminations and introduction of improved drought tolerant forage species. Keeping improved and high yielding animals would contribute to increase income of pastoralists in the study area and provide that stable market outlets are assured. Involvement of governmental organization or private livestock investor in utilization of the large amount of natural mineral soil sources is found in the region to produce the mineral blocks that meet the standard of complete mineral mix and to sell for pastoralist with minimum cost. In both zones, the failure of rainfall greatly reduced the availability of pasture for grazing and most crops withered away due to the lack of moisture. Hence, it is essential that priority should be given to construct and/or rehabilitate ponds, underground water storage and other infrastructure for collection and storage of rain water. Preparing shallow and hand dug wells can also increase the water supply of the areas. Therefore, these water management activities should be given first priority in the development programs of the areas.

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