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Cattle Feed Resource, Water Sources and Housing System in the Central Rift Valley of Oromia Regional State, Ethiopia

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ABSTRACT

The study was conducted in Adami Tulu Jidokombolcha (ATJK), Bora, Dodola, Shala and Negele-Arsi districts with objective to assess main cattle feed resources, water sources and housing systems. A pre-tested, semi-structured questionnaire was used to conduct survey. About 240 respondents were identified using random sampling techniques. Collected data was analyzed by SPSS statistical software (Ver. 24). Study result indicates that household in average had three hectares of land and allocated about two hectares of land for crop cultivation. Most respondents reported that cattle herding is not common during dry season while it is common during wet season. Survey result indicate that natural pasture, weed and maize tiller and stored crop residues are main feed resources in wet season while crop after math, crop residue and fodder trees are main resources during dry season. Brackish, local mineral and common salt are mineral sources for cattle in study areas. Lake, river and boreholes are important water sources in dry season where as ponds and rivers are main water sources during wet season for their cattle. The observed cattle watering frequency is mainly once a day. Housing system practiced in the study areas is mainly Kraal. The information generated from this study on land size per household, cattle herding system, feed resources, mineral sources, water sources, water utilization and housing type can be used as a baseline for any livestock development programs in those and similar areas.

1. Introduction

Agriculture is the main sector in the economy of Ethiopia. It is serves 85% of the population of the country. The livestock subsector is an integral part of the country's agricultural production system and contributes significantly to the country's economic development. Cattle contribute nearly all the draught power for agricultural production at smallholder level in Ethiopia [1,2]. Other authors [3] stated that cattle provide draught power, milk, manure and cash to their owners. They provide cash during crop production failure and collateral for local informal credit.

Beside the huge livestock numbers, the productivity per head was a challenge in the subsistence mixed farming systems areas of Ethiopia [4]. Animals' feed is the main factor that limits livestock productivity in the country

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and there are seasonal fluctuations in feed supply in both quantity and quality. Feed scarcity especially during the dry season is a major constraint in livestock production and it determines to a large extent the performance of the livestock sector [5]. Grazing lands are shrinking and livestock are kept in low potential lands that are not suitable for crop production and others purposes [6].

The water is also a factor that affects the productivity of the livestock. Inadequate water in availability as well as in quality can cause problems like constipation, dry digestive tract, reduces metabolically activities with emaciated body condition [7]. Water availability fluctuates within and across years.

Identifying the available cattle feed resources, mineral sources, water sources and housing practices in livestock production system enables to design appropriate intervention for future research and to design appropriate livestock policy. However, information on cattle feed resources, mineral sources, water sources and housing system found in East Shoa and West Arsi Zones was scanty. Therefore, this study was designed to assessing on main cattle feed sources, water sources and housing system in East Shoa and West Arsi Zones of Oromia region.

Objectives

To assess main feed resources, mineral supplementation sources, water sources and housing systems in study areas.

2. Material and Methods

2.1 Map of Study Areas

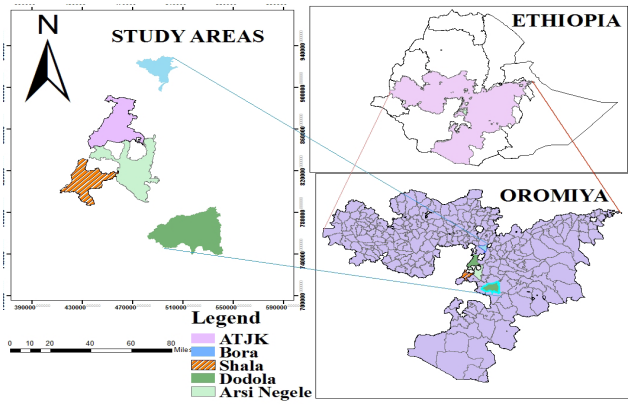

Figure 1. Map shows study areas

2.2 Description of Study Areas

Bora, ATJK and Negele-Arsi are situated on the main Addis Ababa - Shashamane road and located at 110, 160 and 226 km respectively south of Addis Ababa city, respectively. Dodola district is located at 324 km South-East and found on the Addis Ababa - Shashamane - Bale Robe road, while Shala district is located at 281 km South on the main Addis Ababa - Shashamane -Wolaita road.

2.3 Sample and Sampling Design

Multi-stage purposive sampling technique was employed for the selection of study districts. Accordingly Adami Tulu Jidokombolcha (ATJK) and Bora from East Shoa Zone, while Dodola, Shala and Negele-Arsi from West Arsi Zone were purposively selected based on Arsi-cattle potential in the Zones. The samples were proportionate according to the total numbers of farmers per district. Accordingly, a total of 240 households were randomly selected and interviewed. Two Kebele were selected from each district based on their cattle potential and famers who have cattle were randomly selected for interview.

2.4 Data Collection

A semi-structured questionnaire was developed and tested before administration. Some re-arrangement, reframing and correcting was done after questionnaire test. The questionnaire includes house holding land size, cattle herding system, main feed resources, mineral source, water sources, watering frequency and housing systems. Enumerators were employed and trained on data collection. During the interview process, every respondent was made to understand about the objective of the study to make life easy while conducting the survey. Focus group and key informant discussion were conducted to strengthen the data from semi-structured questionnaire. The group discussion mainly focuses on watering frequency and mineral sources. All secondary data was collected both from published and unpublished source as per the demanded.

2.5 Methods of Data Analysis

Questionnaire data gathered during the study period was checked for any error, coded and entered into excel spreadsheet. The SPSS statistical software (Ver. 24) was used to analyses qualitative and quantitative survey data.

3. Results and Discussions

3.1 Land Holding Size of the Respondents

The results (as indicated in Table 1) show that total landholding was lower in Shala and larger ($P<0.05$) in Dodola. Grazing land size was smaller in Bora and Shala districts, while it was highest ($P<0.05$) in Dodola district.

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The study further indicated that there was no significant difference in the cropping land size across the studied locations.

Table 1. Land holding per households in studied areas (Mean±S.D)

District	Total land (ha)	Grazing land (ha)	Cropping land (ha)
ATJK	3. 5±1.4[b]	1.2±0.4[b]	2.2±1.1
Bora	2. 6±1.5[ab]	0.6±0. 4[a]	1.9±1.3
Dodola	4.2±2.6[c]	1.8±1.6[c]	2.3±1.4
Shala	2.1±1.3[a]	0.4±0.5[a]	1.7±1
Negele-Arsi	2.9±2.2[ab]	0.9±0.8[b]	1.9±1.5
Overall	3.1±2.2	1±1.1	2±1.3

Note: [a,b,c] P<0.05 values across columns were different

The results of the total land holdings and the grazing land sizes indicated in table 1 are in close accordance with the findings of Belay *et al*., [8]. However, the average land holdings as observed in this study are lower than those reported by Kebede *et al*.,[9] from Southern parts of Ethiopia and higher than those reported by Mengistu *et al*., [10] from Kedida district in Gembela region. The land holdings usually correlate with the fertility of the land, i.e. land holdings are usually less if fertile and vice versa [11]. It can also be ascribed to the population of the area i.e. land holdings are usually high if the population is sparse [12].

The study also indicated that the amount of grazing land is correlated with the land holdings, (which is higher at Dodola in both the cases); this too coincides with the findings of Tadesse and Solomon [13]. The m larger the grazing land size, the higher the numbers of livestock it can maintain. Contrary to the same, if the grazing land is sparse the chances of land degradation are higher and so is the carrying capacity of the land [14]. Under both the cases the respondents need to be appraised about the pasture management techniques thereby ensuring that the carrying capacity is maintained the year round. The respondents too need to be made aware of rotational grazing techniques so that the parasitic loads can also be managed effectively [13]. The study also indicated that in most of the areas the land allotted for grazing is low, thereby the respondents need to be made aware of the pasture management techniques and also to practice cut and carry system so that the grazing land is well managed [15].

3.2 Cattle Herding System Prevalent in the Study Areas

The findings as presented in Table 2 relating to the herding management of cattle indicate that during the dry season most of the cattle roam around freely. Tethering and zero grazing were practiced by small numbers of respondents only. During the wet season, on the other hand, most of the respondents claimed to herd their cattle and few other use tethering.

Table 2. Cattle herding system across studied areas as reported across the different seasons (%)

	District						
Dry season	ATJK	Bora	Dodola	Shala	Negele-Arsi	Overall	χ^2
Not herding	66	65.8	59.6	68.2	60.7	63.8	
Herding	30	18.4	34.6	31.8	26.8	28.8	0.13
Tethering	2	2.6	3.8	0	7.1	3.3	
Zero grazing	2	13.2	1.9	0	5.4	4.1	
Wet season							
Not herding	2	0	0	2.3	5.4	2.1	
Herding	80	68.4	80.8	88.6	83.9	80.8	0.43
Tethering	12	21.1	17.3	6.8	7.1	12.5	
Zero grazing	6	10.5	1.9	2.3	3.6	4.6	

The findings show that most of the respondents do not herd their cattle during the summer months, which is in close accordance with the observations of Zewdu, [16]. This may be ascribed to the fact that during the dry season the pasture lands are degraded and the agricultural plots are fallow, thereby the cattle are roaming around. This was followed by herding the cattle which too accords with the observations of Belay and Minele, [17].

The study also indicates that during the wet season most of the cattle are herded individual which may be ascribed to the fact that during the wet season the agronomic activates are in full swing [16]. Herding is also carried out to avoid the presence of predators that usually attack livestock in groups. The findings also indicate that some of the cattle are tethered in the homestead which is carried out mainly for the fattening, sick, infirm, pregnant and calves which too are in close accordance with the findings of Teshager *et al*., [18].

3.3 Main Feed Resources in the Study Areas

Figure 2 presents the major feed resources in the studied locations as reported by the respondents. During the wet season, most of the cattle depended on natural pasture followed by crop residues. Maize (thinning) and weeds were the other sources of feed available for cattle at wet season. The type of fodder available during the dry season was grossly restricted to crop aftermaths and residues. Fodder trees and shrubs are mostly used for browse in dry season.

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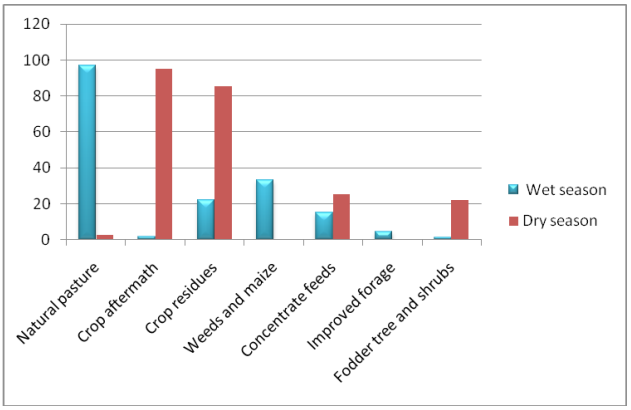

Figure 2. frequency of feed resource availablity at study area

The usages of natural pasture as a primordial source of forage for livestock is in close accordance with the findings of Zewdie and Yoseph, [5] from central rift valley of Ethiopia, Western Oromia Regional State and Mengistu *et al*., [10] from Kedida district in Gembela Regional State. However, over the years the natural pastures are shrinking and so is their carrying capacity, which is leading to their degradation over period of time, this too is in close accordance with the findings of Alemayehu *et al*., [15]. The farmers need to be made aware of the methods of pasture conservation besides advocating rotational grazing [14].

Feeding of livestock on crop residues are in close accordance with the findings of Sefa, [18] however, the crop residues usually have low nutrients [15]. The farmers need to be made aware of methods to improve the feeding capacity of the crop residues; therefore trainings towards conservation and improvement of crop residues for livestock feeding and post-harvest losses due to fungus and mycotoxins [20] are imperative for the farmers [10].

The usage of concentrate feeding in livestock has been reported by Tamrat [21], especially among the pregnant and nursing dams, however the farmers need to be made aware of the different feeding practices and hygiene of the concentrate feed and the barn so as to minimise the risk of mycotoxin related infestation as there have been several reports of high mycotoxin content in milk which can have long term consequences in veterinary and human terms [20]. The feeding of weeds and cereals crops thinning like the maize plantation, which are in accordance with Zewdie and Yoseph [5] too need to be carefully monitored for the presence of poisonous plants and also agro chemical residues which too can have adverse consequences to the health of the livestock.

Fodder trees and shrubs are animal feed resources particularly in dry season. Browse species are green feed resources in the dry season [4]. Some plants have toxic property [22] due to their content like tannins and others phenolic compounds which reduce their utility [4] that need to be carefully monitored during livestock feeding.

3.4 Mineral Supplementation Provided to the Cattle

The results as presented in Table 3 indicate that brackish water is provided to the cattle in ATJK, Shala and Negele-Arsi (due to their proximity to the water bodies), while in the remaining two locations minerals are provided in the form of salts and locally available mineral licks (Bole salt).

Table 3. Practice of feeding mineral supplementation in the studied areas (%)

	Districts						
Mineral sources	**ATJK**	**Bora**	**Dodo-la**	**Shala**	**Nege-le-Arsi**	**Overall**	**$\chi 2$**
LM	30	26.5	61.4	12.3	13.6	28.76	
Salt	12	60.6	34.6	5	7.5	23.94	0.00
Brackish	58	12.9	4	82.7	78.9	47.3	

Note: LM: Local mineral (Bole), Brackish is salty water

The findings show that the respondents provide salt to their livestock, which is appreciable and is expected to improve their production and reproduction performances [23]. However, the qualities of the salt licks need to be ascertained using formal research and thereby specific licks need to be formulated across the studied locations [24].

Balancing of minerals is important for specific classes of livestock. A particular level may be deficient for some species and classes, while there are also chances that the same level may be toxic for other species /classes of livestock [23]. The study further indicated that in places where brackish water lakes are available the respondents prefer to take their animals to such locations while salt and bole (soil containing minerals) are provided by the respondents in other places, these observations too are in close accordance with those of Muluken *et al*., [24] from Wolaita Zone.

3.5 Main Water Sources for Cattle

The findings from Table 4 indicate that during the dry season the source of water varied across locations. Borewell was used as a major water source at Bora, while the residents of Dodola use the water from the nearby rivers. The results also indicate that water from the lakes was used in the ATJK, Bora, Shala and Negele-Arsi districts. The results also indicated that except for Dodola most of the respondents in the other locations depended on pond water for their livestock during wet season, while at Dodola they used water from the nearby river.

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Table 4. Main water sources in the studied location and across the seasons studied (%)

	District						
Dry season	ATJK	Bora	Dodo-la	Shala	Negele-Ar-si	Overall	χ^2
Bore well	18	39.5	5.8	19.6	16.8	19.94	
Pond	22	11.8	17.7	6.8	10.7	13.8	
River	28	16.7	71.5	12.7	20.8	29.94	0.00
Lake	32	32	5	60.9	51.7	36.32	
Wet season							
Borewell	8	5.3	0	4.6	7.1	5	
Pond	56	73.7	11.4	95.4	55.4	55.8	0.00
River	36	18.4	88.6	0	28.6	36.7	
Lake	0	2.6	0	0	8.9	2.5	

Water is the most neglected yet the most important of all the nutrients vital for all the physiological and biochemical and physiological processes for livestock [17]. The results from the study indicated that lake, river and borewell were the important water sources in dry season. The findings are in close accordance with the observations of Tewodros and Mebrate [25]. Water from the borewell is relatively safe; however those from the rivers need to be monitored regularly for any diseases or waste carcass that may be a potential threat to livestock and coming from upstream [26]. Care should also be taken to fence off the areas where the livestock usually come for drinking water so that predatory attacks can be minimized [27].

The results as presented in Table 4 indicate that the source of water during the wet season is pond and river water, which was consistent across all the studied areas. These observations are in close accordance with those of Teshager *et al*., [18] from Illu Aba Bora Zone. However, the respondents need to be made aware of the fact that water from pools and ponds can be a potential contaminant if the watering points are not well maintained [26]. Therefore, the respondents need to fence off the watering points for the livestock, which has to be away from those used by their owners. The ponds have to be constructed so that the runoff from the agricultural plots can be cached in [27].

3.6 Water Utilization

The findings in Table 5 indicate that during the dry season the watering frequency varied across locations. The majority of respondents reported that their cattle get water once per day followed by once per two days and twice per day in dry season. According to the group discussion, watering frequency at wet season is once per day or freely available in all study areas.

Table 5. Cattle watering frequency at dry season (%)

	District					
Water frequency	ATJK	Bora	Dodola	Shala	Negele-Ar-si	Overall
Free available	4	2.6	5.7	1	1.7	3
Once /day	60	52.6	59.6	43.2	39.2	50.92
Twice/day	4	10.5	25	2.2	5.6	9.46
Once /2day	20	26.5	7.7	15	26.7	19.18
Once /3day	10	5.2	1.1	18.2	14.3	9.76
Once ≥4day	2	2.6	0.9	20.4	12.5	7.68

The cattle watering frequency are different across the study areas which may associate to their water sources (Table 4). The seasonal water availability and watering frequency disparity affects the water intake of different livestock classes that decreased feed intake and dictates animal productive performance [25]. The watering frequency might be affected by season, accessibility, water sources and type of animal feeds [4]. The often watering frequency of cattle reared in Shala is once ≥4days once per 4 -7 days due to water source salty. The respondents report that Shala lake water is too salty.

3.7 Housing System Provided to the Ccattle

Cattle of all age and sex groups, except suckling calves, were housed together during the night. Young calves were housed separately in closed house to prevent them from suckling their dam, and protect them from trampling, predators, wind, rain and theft. The kraal, yard, separate house and in-family house (Table 6) are the major cattle house types in the study area. The houses are made from locally available materials and it was purposively done for protecting the animals from predators, rain, extreme of weathers and thefts.

Table 6. Cattle house type in studied areas (%)

	District						
Type	ATJK	Bora	Dodola	Shala	Negele-Arsi	Overall	χ2
In-family House	2	0	0	2.3	1.8	1.25	
Separate House	0	5	9	4.5	0	3.75	0.01
Kraal	98	79	89	93.2	87.5	88.75	
Yard	0	16	6	0	10.7	6.25	

The findings as presented in Table 6 indicate that most

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of the cattle are housed in the Kraals, which too are in close accordance with the findings of Belay and Minele [17]. Housing system is one of the important parts of the management as a proper house can provide comfort to the animals being housed, besides save the animals from the extreme of weathers besides predatory attacks and thefts [28].

Kraals can to certain extent protect the cattle against predators but there are chances that the animals get trampled when housed together especially those which are old, infirm, pregnant and nursing [17]. This can also lead to deaths among the infirm cattle and therefore, the respondents need to be made aware of better housing of their livestock [29]. The kraal usually does not have any roof, therefore the cattle are exposed to vagaries (extreme of weather) of nature and hence the respondents need to be made aware of proper construction of houses, especially the floors, their slope and also the roofs need to be constructed [18]. The study also indicated that very few respondents provide proper housing to their cattle, which can be considered as a production constraint and if improved it can help the reproduction and production of the cattle to a greater extent [29].

Current study indicates that kraals type housing is common practice across study areas. The farmers periodically shift the location of the kraal to adjacent sites. This is important to achieve two objectives simultaneously viz. to maintain cleanliness of the kraal by moving it to an adjacent new site when the kraal becomes muddy and secondly to distribute the manure on the farm land as the kraal is moved to different areas of farmland. Kraals are made from locally available materials. It is constructed from bamboo in Dodola, where as mainly constructed from acacia tree branches in Shala, Negele-Arsi, ATJK and Bora districts.

Figure 3. Kraal from acacia tree branches

Figure 4. Kraal made from bamboo tree

4. Conclusion and Recommendation

From this study it can be concluded that natural pasture and crop residues are main feed resources in the study areas. Brackish, local mineral and common salt are mineral sources for cattle in the study areas. Lake, river and bore wells are important water sources in dry season, where as ponds and rivers are main cattle water sources during wet season. Kraal is major cattle house type used in the study areas. The information generated on land size per household, cattle herding system, feed resources, mineral sources, water sources, water utilization, housing type should be baseline for any livestock development programs in the areas.

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