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LIVESTOCK FEEDS AND FEEDING SYSTEM IN ENSET (*Ensete ventricosum*) DOMINATED MIXED FARMING SYSTEM OF SOUTHERN ETHIOPIA

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ABSTRACT: This study was conducted to identify the livestock feeds resources, feeding systems, feed related problems and the determinant factors under smallholder farmers' livestock production system in the Sidama zone of Southern Nations, Nationalities and People's Region (SNNPR) of Ethiopia. A total of 135 sample household heads which represents about 10 percent of the household heads in the two study districts (Shebedino and Dale) were included in the study. According to the order of importance, natural grazing/scavenging, crop residue and purchased feeds from market/other farmers were the major (X^2=1078.103, p<0.001, n=553) feed resources used to fed different livestock species/classes in the area. Due to the economic importance difference among species/classes, the provision priorities of each particular feed resource were also significantly different. Especially the provision disparity was more (X^2=302.96, p<0.001) pronounced for crop residue for which male cattle (oxen and young bulls) get top priority than natural pasture (X^2=157.48, p<0.001) on which other species/classes are highly dependent and purchased feed (X^2=62.29, p<0.001) by which the scavenging poultry production is subsidized. In feed production, conservation and treatment aspects, growing of improved forages is not common practice in the area and majority about 57.0% (n=77) of farmers have not grown improved forages (X^2=4.28, p<0.001), considerable 63.7% (n=86) and limited 25.9% (n=35) of farmers have also practiced feed conservation (mainly maize Stover and elephant grass) (X^2=15.96, p<0.001) and crop residue treatment (mostly add and mix salt) (X^2=33.34, p<0.001), respectively. Grazing land is a scares resource in the livestock production sub-system of the area and only about 34.1% (n=46) of the farmers in the study area posses private grazing land with an average holding of 0.073±0.014 ha. Land shortage, feed shortage and population pressure were identified as major (X^2=132.09, p<0.001) problems in related with feed availability in the area. The extent of land shortage (X^2=10.595, p<0.01) and population pressure (X^2=14.016, p<0.001) problems were different between farmers at the two study districts.

Keywords: Crop residue, Feed resource, Natural pasture, Priority, Sidama zone, SNNPRS.

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INTRODUCTION

Despite the large livestock population in the country, the sector's contribution is well below its potential due to various reasons such as feed shortage and disease (Berhanu et al., 2009), less efforts in introducing the appropriate package of improved livestock technologies such as cross breeds, improved feeds management practices and inadequate healthcare services which enhance the current livestock production and productivity (Getahun, 2012).

The major feed resources in the country are crop residues and natural pasture, with agro industrial by-products and manufactured feed contributing much less (Berhanu et al., 2009; Anteneh, 1984; Alemayehu, 1987). The importance of natural pasture is gradually declining because of the expansion of crop production into grazing lands, redistribution of common lands to the landless and land degradation (Berhanu et al., 2009).

In the Ethiopian highlands, natural pasture can produce 6 tons DM/ha but when continuously grazed it yields only 2.5 tons DM/ha (Jutzi et al., 1987). As frequent grass out take leads to a reduction in DM yield up to 50 percent, yield from heavily grazed pasture may not exceed 1.5 tons DM/ha (Jutzi et al., 1987). According to Lulseged (1985), native pasture land in the Ethiopian highlands have been estimated to be 73 million hectares supporting about 24 million livestock units (LU) in the same area. These figures indicate that native pastures are an important feed source. However, even when a high average dry matter production of three tons per hectare per year is assumed for this grassland, these areas could only contribute a maximum of 50 percent of the total feed required.

According to different reports, about half or more of all animal in the Ethiopian highlands obtain their feed in the form of crop residues (straws, stubble, chaff or weeds from crop plots). The dependence on this feed source is likely to continue along with increasing human population densities and corresponding extension of crop land into traditional grassland (Abate et al., 1993). Moreover, Alemu et al. (2000) have indicate that due to crop

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encroachment, the contribution of crop residue represent the largest amount of feed and regularly conserved as a sole feed of dry season for animals in the highlands of Ethiopia and it provide 10 to 15 percent of the national intake of feed by livestock, and in some areas the estimate would increase up to 50 percent (Zinash et al., 2001 and Alemayehu, 2003) and it can account up to 70% of animal feed in the highland parts of the country (Zinash and Seyoum, 1991). Moreover, the contributions of crop residues reach up to 80% during the dry seasons of the year (Tolera, 2007). In terms of biomass, crop residue, aftermath grazing and pulse residues contribute 0.5, 1.84 and 0.404 million tones out of the total dry matter feed resources of 41.66 million tonnes available annually in the highlands of Ethiopia (Alemayehu, 1987).

With the poor quality of livestock feed in the country, the feed shortage is also exaggerated by its erratic and seasonal supply. Hence, there is severing feed shortage during the dry season and at the beginning of the main rains. The most critical period is between April and the beginning of July, when all feed resources is virtually depleted (Getachew et al., 1993). In spite of this fact, seasonal feed deficiencies cause loss of weight that was gained during more favorable periods. Fodder conservation to help eliminate seasonal feed-supply fluctuations is rarely practiced.

Several studies have been conducted on fodder production and use in Ethiopia, both by national and international research organizations. However, the focus of the studies was limited to the agronomic and nutritional characteristics of feed resources, and animal responses to types of feeds and feeding practices (Bediye et al., 2001). However, characterization of available feed resources, its feeding system, and feed production and management system of the smallholder farmers in the highland parts of the country in general and the specific study area in particular are scanty.

Therefore, considering all these facts, and the severity of feed shortage in livestock production sub system of the region it would be important to characterize the feed production, management, important feed related problems and available feed resources of the area to identify research and development interventions, and to recommend path ways for the future.

MATERIAL AND METHODS

Study Area

Sidama zone, found in Southern Nations, Nationalities and People's Region (SNNPR) of Ethiopia, lies between 380 08' E to 390 10' E longitude and 60 40' N to 70 06' N latitude at an elevation ranging from 501 m to 3000 meters above sea level (SNNPRS, 2010). Currently Sidama Zone is divided in to 19 districts hosting a total population of over 3,504,049, with land mass of 6,832.85 sq. km and a population density of 512.8 Person/sq.km (CSA, 2012). Out of the total land size of Sidama zone, 26.8% is lowlands, 45.49% midlands and 27.71% highlands (SNNPRS, 2010). Farmers in the area practices crop dominated mixed crop-livestock agriculture. The zone is one of the major coffee growing areas of southern Ethiopia; cultivated and wild coffee is a main cash crop of the area.

Sidama zone is well endowed with natural resources contributing significantly to the national economy of the country. Other than coffee, maize, haricot bean, root crops ("*enset*" false banana and potato) and fruits are major crops grown in the zone. Haricot bean and Chat (Chata edulis) production are other sources of cash after coffee. Enset (*Ensete ventricosum*) is a strategic crop substantially contributing to the food security of the zone and is especially important in the highland parts of the zone (Kassu, 2009). According to SNNPRS (2010), the zone have bimodal production seasons known as "*Belg*" (short rainy season) from March to April and "*Meher*" (main rainy season) from June to September. The zone receives average annual mean rainfall ranges 801- 1600 mm with annual mean temperature of the zone ranges between 10.1-27 0C (SNNPRS, 2010).

Sampling Procedure

Reconnaissance survey was conducted to have the notion of understanding about the study area and to select the representative study sites (districts) before to get on questionnaire. Different participatory rural appraisal (PRA) tools, purposive and Probability Proportional to Size (PPS) sampling approach were used to collect data from the study. Out of the total 19 districts in Sidama zone 10% or two districts (Dale and Shebedino) and out of districts total (36 and 32) PAs four and three Pas` with total sample households of 135 (63 and 72 from Dale and Shebedino districts) were selected, respectively. Moreover, in order to capture gender effect in the study objectives, the total sample households at each district and PA's level were further stratified into female and male headed households and 15 women and 120 men household heads were included in the study.

Data Analysis

In data analysis two groups of explanatory variables i.e. socio economic characteristics (N=6) and asset related variables (N=10) having different levels of groups were used for their effect on dependent variables that were considered (Table 1). In case of dependent variables having priority data nature and depend of the priority level four (4= 1st priority, 3= 2nd priority, 2= 3rd priority, 1= 4th priority) or three (3= 1st priority, 2= 2nd priority and 1= 3rd priority) likert scales were used in the analysis process.

Friedman's tests were used to rank the priorities among dependent variables to identify their ranks and to consider high ranked variables for furthers analysis. The associations among dependent variables and with deferent explanatory variables were evaluated using Spearman's-Correlation (r_s). Kruskal Wallis test was also used to

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identify the effect of explanatory variables on dependent one. All these statistical procedures were performed using SPSS release version 22 (IBM SPSS Statistics, 2013).

Prior to the required statistical analysis, the hypothesized explanatory variables were checked for the existence of multicolinearity using Variance Inflation Factor (VIF) for association among the explanatory variables. According to Gujarati (2003), VIF can be defined as: VFI (X_i) = $1/1\text{-}R_i^2$

Where

R_i^2 is the square of multiple correlation coefficients that results when one explanatory variable (X_i) is regressed against all other explanatory variables. As a rule of thumb, if the VIF of a variable exceeds 10, it is an indication of a multicolinearity problem and removed from further analysis. The VIF values displayed below (Table 1) have shown that all the predictor variables have no serious multicolinearity problem.

Table 1 - VIF of the Explanatory variables used in the study

Explanatory Variables	Tolerance	VIF
Socioeconomic characters		
District (n=2)*	0.613	1.633
Gender (n=2)	0.771	1.296
Age group (n=3)	0.735	1.360
Educational background (n=4)	0.681	1.469
Marital Status (n=3)	0.641	1.561
Family size group (n=4)	0.744	1.345
Asset related		
Total TLU holding group (n=3)	0.284	3.518
Farm land holding group (n=3)	0.672	1.488
Sheep Ownership (n=2)	0.915	1.092
Goat Ownership (n=2)	0.881	1.135
Male cattle Ownership (n=2)	0.702	1.425
Female cattle Ownership (n=2)	0.310	3.226
Calf Ownership (n=2)	0.747	1.338
Poultry Ownership (n=2)	0.861	1.161
Donkey Ownership (n=2)	0.752	1.331
Grazing land Ownership (n=2)	0.905	1.105

*n= number of groups within variable, VIF= Variance Inflation Factor ,

RESULTS AND DISCUSSION

Feed resources and feeding priority

Available feed resources: The feed resources and types to provide for different livestock species/class would be governed by different factors. Among which economic importance of the animal and availability of feed resources and types are the most important. Accordingly, in the study area natural pasture, crop residue, market purchased feeds and grown improved forages have been identified as available feed resources that are used in livestock production activity. However, their utilization priorities were significantly (X^2=1078.103, p<0.001) different (Table 2) and natural pasture, crop residue and market purchased feeds were identified as the major feed resources with highest mean rank value >2.00 and these feed resources were considered for further analysis here onward. Maize Stover, Enset and Sugarcane leaf were the dominant feed types in crop residue resource. The importance of natural pasture and crop residue in this study is in agreement with (Bilatu et al., 2012; Tolera et al., 2012; Ahmed et al., 2010; Belay et al., 2012).

Table 2 - Friedman's mean rank test for utilization priorities of identified feed resources in the study area (N=553).

Feed resources	Mean	Std. Deviation	Mean Rank	Rank
Natural pasture	3.69	0.68	3.76*	1
Crop residue	1.65	1.69	2.60*	2
Market purchased feed	0.93	1.17	2.06*	3
Improved forage	0.06	0.36	1.57	4
Chi-Sq			*1078.10*	
Sig.			*0.000*	

4= 1st priority, 3= 2nd priority, 2= 3rd priority, 1= 4th priority, *high priority feed resources

Livestock feeding priorities: As the result presented in Table 3 indicates, the provision priority of the three major feeds resources for each species/class was significantly different. Except young bulls (X^2=22.45, p<0.001, N=22) and oxen (X^2=4.57, p>0.05, N=7) which have access for crop residue at highest priority and equally chance of getting those major feed, respectively which may relate with significant role in income generation of young bulls and limited ownership, the other livestock species/classes were mostly depend on natural pasture and rarely crop residue.

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Table 3 - Provision priorities of major feed resources for different livestock species and classes in the study area.

LS species	N	Crop residue	Rank[1]	Natural pasture	Rank	Purchased feed	Rank	Chi-Sq[2]	Sig[2]
Sheep	16	2.06**	5	2.75***	6	1.19*	9	19.63	0.000
Goat	23	2.02**	6	2.65***	8	1.33*	6	21.91	0.000
Oxen	7	2.57***	1	2.00**	12	1.43*	4	4.57	0.102
Y. Bull	22	2.50***	2	2.32**	11	1.18*	10	22.45	0.000
Cow	97	2.32**	4	2.52***	9	1.16*	11	103.85	0.000
Heifer	39	2.37**	3	2.51***	10	1.12*	12	46.46	0.000
F. Calves	52	1.93**	7	2.77***	5	1.30*	7	58.60	0.000
M. Calves	33	1.89**	8	2.71***	7	1.39*	5	31.11	0.000
Layer Birds	88	1.45*	11	3.00***	1	1.55**	2	157.41	0.000
Broiler Birds	88	1.45*	12	3.00***	1	1.55**	1	168.32	0.000
Dual Birds	81	1.48*	10	3.00***	1	1.52**	3	141.67	0.000
Donkey	7	1.86**	9	2.86***	4	1.29*	8	9.54	0.008
Chi-Sq[3]		302.96		157.48		62.29			
Sig. [3]		0.000		0.000		0.000			
Average		1.99		2.67		1.33			

Mean feed provision priority value of each species/class with *** = 1st priority, **= 2nd priority and *=3rd priority
Cho-sq and p-value with [3] and [2] are respectively for among species/classes for specific feed and among major feed resources for each species/class. [1] Priority/rank of specific feed resource provision among species/classes.

Due to the economic importance difference among species and classes, the provision priorities of each particular feed resource were also significantly different among species/classes. Especially the disparity were more (X^2=302.96, p<0.001) pronounced for crop residue (Table 3) than natural pasture (X^2=157.48, p<0.001) and purchased feed (X^2=62.29, p<0.001) resources. Accordingly, considering male cattle (oxen and young bull) have better chance in getting crop residue followed by females (milking cow and heifers). The dependency on natural pasture feed resource which is seasonal available and having low quality were more for poultry followed by donkey. However, the high dependency of poultry on natural may compensate with their better access for purchased feeds than other species/classes. Next to different classes of poultry, oxen have better chance in getting purchased feeds than other species/classes.

Feed production, management and conservation

Regarding feed production, management and conservation practices, growing of improved forage was not a common practice in the area and majority (57.0%, n=77) of farmers have not grow improved forages. This result is in agreement with Abate et al. (1993) who indicated the fact that no special effort is made to grow feed for farm animals in subsistence-oriented smallholder production system in the Ethiopian highlands. Admassu (2008) has also reported that forage development is a key to skip feed shortages if practiced but it is at an infant stage in terms of usage. Moreover, about (63.7%, n=86) of farmers respond as they practiced feed conservation to overcome seasonal feed shortage problem they faced (Table 4). In order to increase the palatability and nutritive value of the crop residues only (25.9%, n=35) of farmers were found to add and mix mostly salt.

Table 4 - Respondent experience status for improved forage growing, feed conservation and crop residue treatment in the study area (N=135).

Farmers status	Improved forage growing (%)	Feed conservation (%)	Crop residue treatment (%)
Not have (0)	57.0	36.3	74.1[a]
Who have (1)	43.0	63.7	25.9[b]
Chi-Sq	4.276	15.955	33.337
Sig.	0.039	0.000	0.000

a,b; % within a column with different superscripts differ significantly (P<0.001)

As the result in Table 5 shows, farmers at Dale were better experienced in crop residue treatment (X^2=33.09, r_s =0.497, p<0.001) and improved forage growing (X^2=4.244, r_s =0.178, p<0.05) than Shebedino farmers who were advanced in feed conservation experience (X^2=15.84, r_s =0.344, p<0.001). Farmers who have family size range of B/n 7-9 persons and >=10 persons have better experience of feed conservation (X^2=12.69, r_s =0.272, p<0.05) than the others (Table 5).

As the correlation and mean rank test among respondents feed management and production experiences with asset related variables indicates, the total TLU holding, goat and male cattle ownership status have positive associations with crop residue treatment (X^2=8.059, r_s=0.229, p<0.05), improved forage growing (X^2=4.513, r_s=0.184, p<0.05) and feed conservation experiences (X^2=17.108, r_s=0.357, p<0.001), respectively. Accordingly,

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farmers who hold larger (>=5.3 TLU), possessed the respective livestock species and class have better experience in feed management, conservation and production than the others (Table 5).

Table 5 - Spearman's correlation and Kruskal Wallis rank test for the effect of socio economic characteristics and asset related factors on feed treatment, conservation and production (N=135).

Variables and Groups	%	Crop residue treatment	Feed conservation	Improved forage growing
Districts				
Shebedino (1)	53.3	54.25	78.44	62.44
Dale (2)	46.7	83.71	56.07	74.36
Chi-Sq		33.090	15.836	4.244
Sig.		0.000	0.000	0.039
r_s		0.497**	-0.344**	0.178*
Family size				
<=3 persons (1)	5.2	69.79	63.57	58.29
B/n 4-6 persons (2)	48.1	72.31	58.23	68.08
B/n 7-9 persons (3)	34.1	65.17	79.29	69.82
>=10 persons (4)	12.6	58.44	76.62	66.79
Chi-Sq		3.572	12.691	0.744
Sig.		0.311	0.005	0.863
r_s		-0.152	0.272**	0.033
TLU holding group				
Small (<=0.38TLU) (1)	10.4	50.50	53.93	53.46
Medium (0.39-5.42TLU) (2)	88.9	69.63	69.44	69.38
Large (>=5.43TLU) (3)	0.7	118.00	92.50	106.50
Chi-Sq		8.059	3.411	4.149
Sig.		0.018	0.182	0.126
r_s		0.229**	0.158	0.167
Goat Ownership				
Not have (0)	82.2	69.35	66.35	65.15
Who have (1)	17.8	61.75	75.63	81.19
Chi-Sq		1.293	1.599	4.513
Sig.		0.255	0.206	0.034
r_s		-0.098	0.109	0.018*
Male cattle Ownership				
Not have (0)	78.5	68.97	61.93	67.02
Who have (1)	21.5	64.47	90.17	71.59
Chi-Sq		0.523	17.108	0.422
Sig.		0.469	0.000	0.516
r_s		-0.062	0.357**	0.056
Calf Ownership				
Not have (0)	45.9	62.48	60.93	60.77
Who have (1)	54.1	72.69	74.01	74.14
Chi-Sq		3.969	5.404	5.322
Sig.		0.046	0.020	0.021
r_s		0.172*	0.201*	0.199*

r_s = Spearman's correlation coefficient followed by ** and * are significant at the 0.01 and 0.05 p-level (2-tailed).
a,b; Mean ranks within a column with different superscripts differ significantly at specified sig. (p-level)

According to respondents' response, three feed resources namely crop residue, natural pasture and improved forages have been identified to be conserved at different priorities and the result is presented in Table 6. As the mean rank of the result prevails, crop residue and natural pasture were the priority resources (X^2=70.22, p<0.001) which mostly conserved by respondent farmers. Even if, the mean conservation rank of improved forages was below the threshold value, its role in addressing the existing feed shortage condition of the area would not be overlooked mainly due to limited farmers experience in improved forage growing and this is in line with Admassu (2008) who reported forage development is a key to skip feed shortages.

Maize Stover from crop residues and elephant and Desho grass either separately or together from improved forage were the major feed types that are mostly conserved by majority of farmers in the area. Therefore, the importance of crop residue in the study area was in agreement with Bekele (1991) who reported crop residue, stubble and roadside grazing as the major sources of feed available in the highlands area. The importance of maize Stover in the study area is also in agreement with de Leeuw et al. (1992) who reported that the residues from maize and sorghum/pearl millet growing in the mid- to low-altitude zones account for 39 and 36% of the total, respectively.

As a result of improved forages growing better status of Dale farmers their conservation priority for this feed resource was higher (X^2=4.144, r_s=0.221, p<0.05) than Shebedino farmers (X^2=10.24, r_s=-0.347, p<0.05) for whom crop residues was a priority resource for conservation. Moreover, due to year round feed demand for donkey which

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has crucial role in transportation need of respondents, crop residue conservation priority of donkey owner respondents was higher (X^2=3.984, r_s=0.217, p<0.05) than who not possessed. However, natural pasture conservation priority was different due to respondents ownership for calves (X^2=3.984, r_s=0.217, p<0.05) and respondents who possessed calves have conserved the specific feed resource at higher priority than who not possessed (Table 7).

Table 6 - Feed resources mean rank priority for conservation (N=86).

Feed resources	Mean Rank	Mean	SD	Rank
Crop residue	2.62	2.26	1.25	1
Natural pasture	1.91	1.06	1.26	2
Improved forages	1.48	0.27	0.79	3
Chi-Sq	70.22			
Sig.	0.000			

SD, Standard deviation

Table 7 - Mean rank for factors affecting conservation priority of feed resources (N=86).

Variables and groups	%	Crop residue	Natural pasture	Improved forages
Districts				
Shebedino (1)	67.9	48.39	45.35	41.32
Dale (2)	34.5	33.90	39.86	47.78
Chi-Sq		*10.24*	*1.15*	*4.14*
Sig.		*0.001*	*0.284*	*0.042*
r_s		*-0.347***	*-0.116*	*0.221**
Calf ownership				
Not have (0)	39.3	46.64	37.12	41.02
Who have (1)	63.1	41.55	47.47	45.05
Chi-Sq		*1.336*	*4.326*	*1.713*
Sig.		*0.248*	*0.038*	*0.191*
r_s		*-0.125*	*0.226**	*0.142*
Donkey ownership				
Not have (0)	91.7	42.04	43.55	44.08
Who have (1)	10.7	56.00	43.06	38.50
Chi-Sq		*3.984*	*0.004*	*1.302*
Sig.		*0.046*	*0.950*	*0.254*
r_s		*0.217**	*-0.007*	*-0.124*

r_s = Spearman's correlation coefficient followed by ** and * are significant at the 0.01 and 0.05 p-level (2-tailed).

Grazing land ownership and holding

Due of high demand of crop land resulted from increasing human population pressure; grazing land was a scarce resource in the study area. As reported by farmers, it has also been decreasing from time to time. Accordingly, only about (34.3%, n=46) of the farmers in the study area posses very small 0.073±0.014 ha size of private grazing land (Table 8) whose lands are mostly located at farm boundary and around the homestead. This average grazing land holding was far lower with individually owned pasture lands of 0.2, 0.5 and 0.1 ha at Dogollo, Ginchi and Inewari, respectively (Getachew et al., 1993) and the average private grazing land holding of 0.22±0.02 ha. at Yerer watershed of Adaa Liben district (Samuel, 2005) which are part of Ethiopian mixed farming highlands. Moreover, the grazing lands locations identified in this study are in agreement with Admassu (2008) who reported that private grazing lands in front of homestead are usually the main sources of feeds for livestock in Alaba Woreda, Southern Ethiopia.

Table 8 - Ownership and mean holding (ha.) for grazing in study area (N=135).

Grazing land ownership	%
Not have (0)	34.1[b]
Who have (1)	65.9[a]
Chi-Sq	0.038
Sig.	0.846
Overall mean holding (n=46)	0.0728

r_s = Spearman's correlation coefficient followed by ** and * are significant at the 0.01 and 0.05 p-level (2-tailed).
a,b; % within a column with different superscripts differ significantly at p<0.05.

Feed related problems

Farmers' perception for feed shortage related problems were also assessed and they have also identified the problems based on their priority of importance and the result is presented in Table 9. According to 124 respondents' responses and the mean ranks, the importance of identified problems were significantly (X^2=132.09, p<0.001) different and the first three ranked problems i.e. land shortage; feed shortage and increasing population pressure were identified as major problems and used for further investigation. Feed shortage as priority problem in

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the study area has similarity with similar constraint reported by Dawit et al. (2013) in Adami Tullu Jiddo Kombolcha district, Admassu (2008) in Alaba district and Belay et al. (2012) in Dandi district of Ethiopia.

The extent of land shortage (X^2=10.595, p<0.01) and population pressure (X^2=14.016, p<0.001) as an important problem were different between farmers at the two study districts. Accordingly, land shortage (r_s=0.293) was more critical for Dale farmers than Shebedino's who were more concerned (r_s=-0.338) about increasing population pressure (Table 10).

Moreover, due to long period of land allocation and less ownership for grazing and crop lands which are the main livestock feed sources in the form of grazing and crop residue, the overall feed shortage condition was more critical (X^2=8.348, p<0.05, r_s=-0.236) for younger (<=30Yrs) farmers than those belongs to other age groups (Table 10). Moreover, due to economic importance of male cattle in general and young bull in particular in income generation, farmers limited feed access for this operation was justified by their high priority concern (X^2=6.845, p<0.01, r_s=0.236) of male cattle owners' regarding existing feed shortage problem in the study area.

Increasing population pressure as feed related problem was a priority concern for farmers who possessed sheep (X^2=4.011, p<0.05) and not possessed poultry (X^2=4.935, p<0.02) which may limit those farmers to not expand their flock size and production scope (Table 10).

Table 9 - Friedman's mean rank test for priorities of identified feed related problems in the study area (N=124).

Identified feed related problems	Mean	Std. Deviation	Mean Rank	Rank
Land shortage	1.16	1.35	4.97*	1
Feed shortage problem	1.03	1.43	4.69*	2
Population pressure	0.39	0.99	3.90*	3
Expensiveness of feed cost	0.35	0.87	3.88*	4
Lack of forage materials	0.13	0.58	3.59	5
Lack of income	0.06	0.37	3.50	6
Lack of advice	0.03	0.25	3.47	7
Chi-Sq			*132.09*	
Sig.			*0.000*	

3= 1st priority, 2= 2nd priority, 1= 3rd priority, *high priority problems,

Table 10 - Spearman's correlation and Kruskal Wallis rank test for the effect of socio economic characteristics and asset related factors on priority of major feed related problems (N=124).

Variables and groups	%	Land shortage	Feed shortage problem	Population pressure
Districts				
Shebedino (1)	52.42	53.54	61.19	69.37
Dale (2)	47.58	72.37	63.94	54.93
Chi-Sq		*10.595*	*0.265*	*14.016*
Sig.		*0.001*	*0.607*	*0.000*
r_s		*0.293***	*0.046*	*-0.338***
Age group				
Young (<=30Yrs) (1)	20.16	57.68	77.64	64.16
Middle (31-55Yrs) (2)	66.13	62.43	59.29	63.09
Old (>=56yrs) (3)	13.71	69.94	55.71	57.24
Chi-Sq		*1.470*	*8.348*	*1.235*
Sig.		*0.479*	*0.015*	*0.539*
r_s		*0.107*	*-0.236***	*-0.084*
Crop land holding group				
Small (<=0.5ha) (1)	67.74	61.13	63.81	62.97
Medium (0.6-1.5ha) (2)	30.65	65.08	60.74	61.91
Large (>=2 ha) (3)	1.61	71.00	41.00	54.00
Chi-Sq		*0.536*	*1.346*	*0.384*
Sig.		*0.765*	*0.510*	*0.825*
r_s		*0.064*	*-0.071*	*-0.036*
Sheep Ownership				
Not have (0)	86.29	61.40	64.16	60.96
Who have (1)	13.71	69.41	52.03	72.18
Chi-Sq		*0.909*	*2.450*	*4.011*
Sig.		*0.340*	*0.118*	*0.045*
r_s		*0.086*	*-0.141*	*0.181**
Male cattle Ownership				
Not have (0)	78.23	65.61	58.82	61.03
Who have (1)	21.77	51.33	75.72	67.80
Chi-Sq		*4.156*	*6.845*	*2.105*
Sig.		*0.041*	*0.009*	*0.147*
r_s		*-0.184**	*0.236***	*0.131*
Poultry Ownership				
Not have (0)	34.68	59.47	58.44	68.37
Who have (1)	65.32	64.11	64.65	59.38
Chi-Sq		*0.586*	*1.230*	*4.935*
Sig.		*0.444*	*0.267*	*0.026*
r_s		*0.069*	*0.100*	*-0.200**

r_s = Spearman's correlation coefficient followed by ** and * are significant at the 0.01 and 0.05 p-level (2-tailed).

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CONCLUSION AND RECOMMENDATIONS

Natural pasture in the form of grazing/scavenging, crop residue and purchased feeds from market/other farmers were the major feed resources in the area. Except young bulls which have significant role in income generation and provided crop residue at highest priority and oxen which have equally chance of getting those major feed resources due to limited ownership of the farmers and economic importance, the other livestock species/classes were mostly depend on natural pasture and rarely crop residue.

In feed production, conservation and treatment aspects, majority of farmers have not grown improved forages. However, considerable and limited of farmers, respectively practiced feed conservation (mainly maize Stover and elephant grass) and crop residue treatment (mostly add and mix salt). Grazing land is a scares resource in the livestock production sub-system of the area and only about 34.1% (n=46) of the farmers posses private grazing land with a very small an average holding of 0.073±0.014 ha which are mostly located at backyard and farm land boundaries.

According to respondents' responses and the mean ranks, land shortage; feed shortage and increasing population pressure were identified as major problems, and land shortage was more critical for farmers at Dale than Shebedino farmers who were more concerned about increasing population pressure.

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