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Feed resources availability and livestock production in the central rift valley of Ethiopia

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This study was conducted to investigate feed resource availability in association with livestock production in the Central Rift Valley of Ethiopia. Random sampling was used to select target farms. A total of 60 livestock owners were selected from two districts namely Admi Tullu Jidokombolcha and Dugda Bora both in the central Rift Valley. Structured questionnaire, focused group discussions, secondary data sources and field observations were employed to generate data on household structure, farm size, land use pattern, herd size, herd composition, purpose of livestock raising, major crops grown, crop grain yield, livestock feed types and quantity of total feed. The results of the study indicated that natural pastures and crop residues were the main basal diets in both districts, with crop residues supplying the largest proportion of dry matter.The total livestock population is estimated as 15 and 16 TLU in Adami Tullu Jidokombolcha and Dugda Bora districts, respectively. The total annual DM production met 81 and 80% of the total livestock requirement per annum per farm in Admi Tullu Jidokombolcha and Dugda Bora districts, respectively. From the current study, it was concluded that the available basal roughage feeds were not sufficient to meet livestock dry matter requirement. Alternative means of feed production and supply should be sought with the involvement of all stakeholders.

Key words: Dry matter, feed resources, livestock.

INTRODUCTION

Despite the large number of livestock resources in Ethiopia, its productivity is extremely low (ILCA, 1993). The major constraint to such low productivity is shortage of livestock feeds in terms of quantity and quality, especially during the dry season (Ahmed et al., 2010). Moreover, progressive decline of average farm sizes in response to rising human populations, encroachment of cropping land onto erstwhile grazing areas and onto less fertile and more easily erodible lands, and expansion of degraded lands, which can no longer support either annual crops and pastures contributes to shortage of feed resources (Alemayehu, 2005). Further poor grazing management (e.g. continuous overgrazing) contributes to shortage of feed resources as a result of replacement of productive and nutritious flora by unpalatable species (Ahmed, 2006). Feed supply from natural pasture fluctuates following seasonal dynamics of rainfall (Alemayehu, 1998; Solomon et al., 2008). Despite, these problems, ruminants will continue to depend primarily on forages from natural pastures and crop residues. The livestock sector in the Central Rift Valley (CRV) has been dominated by agro-pastoralists, who have been

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Table 1. Demographic characteristic of the interviewed respondents at Adami Tullu Jidokombolcha and Dugda Bora districts, Ethiopia.

Household variable	Districts	
	ATJ	Dugda Bora
Sex of household head	n=30	n=30
Male (%)	96.7	90.0
Female (%)	3.3	10.0
Overall (%)	100.0	100.0
Average family size per household	n=30	n=30
Males	5.6±0.6	5.0±0.4
Females	5.9±0.5[a]	4.5±0.3[b]
Total	11.5±1.0	9.5±0.6
Wives (% HH with)	n=30	n=30
One	70.0	66.7
Two	16.7	30.0
Three	13.3	0.0

[a-b]Means in the same column sharing different letters of superscripts are significantly different (P<0.05), n = number of respondents, ATJ = Adami Tullu Jidokombolcha, HH = Household head.

permanently settled through the efforts of government and non-governmental organizations. Yet, such smallholders keep livestock to provide them with draught power, transport, savings, and milk (Alemayehu, 1985). Inaddition, the number of animals determines the socio-cultural status of the owner (Amsalu, 2000). However, current baseline information with regard to feed situation is lacking in the CRV. 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. This study was therefore carried out to investigate spatial and temporal availability of livestock feeds.

MATERIALS AND METHODS

Description of the study area

Dugda Bora and Adami Tullu Jidokombolcha districts are located in the Central Rift Valley south of the capital city, Addis Ababa, at an altitude of 1500 -1700 masl. The average annual rainfall in these areas is about 688 mm and the mean maximum and minimum temperatures are 27.2 and 14.4°C, respectively.

Sampling procedures and cross-sectional survey

A prelimenary survey was conducted in order to select specific peasant associations (PAs), of livestock farmers and to get general picture of the study sites. Secondary information from district agricultural offices was also utilized to assist in the selection of PAs. A total of eight Pas (4 from each) were identified from the two districts based on accessibility and availability of livestock. A total of 60 farmers from these PAs were randomly selected from the list of farmers who own livestock. A structured questionnaire was prepared and pre-tested for its applicability before its administration.

Feed quantity assessment

The quantity of feed dry matter obtainable from natural pastures were determined by multiplying estimated annual DM yield per hectare that is, 2.0 t/ha (FAO, 1987). The quantity of available crop residues produced by farmers was estimated by applying grain to straw ratio (FAO, 1987). Accordingly, for a ton of wheat, barley, oat and *tef* straw, a multiplier of 1.5 was used for haricot bean straw a multiplier of 1.2 used for maize a multiplier of 2.0 was used and for sorghum a multiplier of 2.5 was used. Moreover, the quantity of potentially available crop residues for animal consumption was estimated by assuming 10% wastage (Adugna and Said, 1994). The amount of grain yield obtained from the respective crops was quantified by interviewing the farmers and cross checking it with the data recorded by development workers for any deviation. The grazing potential of crop stubbles was estimated using a mean of 0.5 ton per ha as reported by FAO (1987).

Statistical analysis

Data collected were analysed using Statistical Analysis System software (SAS, 2002). Descriptive statistics were employed to describe qualitative variables. T-test was employed to compare variables mean between the two districts.

RESULTS

Household characteristics

About 97 and 90% of the households were male headed while about 3 and 10%, were female headed in Adami Tullu Jidokombolcha and Dugda Bora districts, respectively (Table 1). Of the total interviewed male

Table 2. Educational level of household heads at Adami Tullu Jidokombolcha and Dugda Bora districts, Ethiopia.

Districts	Educational status (% HH heads)						
	Illiterate	Read and write only	Primary school	Junior secondary school	High school	Above high school	Total
ATJ (n=30)	23.3	6.7	53.3	10.0	3.3	3.3	100.0
Dugda Bora ((n=30)	13.3	20.0	36.7	16.7	13.3	0.0	100.0
Overall (n=60)	18.3	13.3	45.0	13.3	8.3	1.7	100.0

ATJ = Adami Tullu Jidokombolcha, HH = Households, n = Number of respondents.

Table 3. Average landholdings per household and land use pattern in Adami Tullu Jidokombolcha and Dugda Bora districts, Ethiopia.

Household variable	Districts	
	ATJ	Dugda Bora
	n=30	n=30
Landholding (ha)		
Total own land*	4.7±0.8	3.8±0.4
Own cropland	3.4±0.5	3.4±0.3
Own grazing land	1.3±0.4	0.3±0.1
Contracted/rented		
Cropland	0.5±0.1	0.9±0.3
Grazing land	0.5±0.1	0.3±0.1
Land allocated for crops (ha)		
Wheat	1.0±0.2	0.7±0.1
Barley	0.5±0.1	0.4±0.1
Tef	0.4±0.1[b]	0.8±0.1[a]
Maize	1.6±0.3	1.3±0.1
Haricot bean	0.8±0.1	0.6±0.1

[a-b]Means in the same row with different letter of superscripts are significantly different from each other (P<0.05), ATJ = Adami Tullu Jidokombolcha, * own land excluding contracted/rented land, n = number of respondents.

household heads, 70 and 67% had one wife at Adami Tullu Jidokombolcha and Dugda Bora districts, respectively, 30% had two or more wives in both districts and 3% in Dugda Bora district had not yet married. The average family size per household across the surveyed areas was 10.5±0.8. The number of females at Adami Tullu Jidokombolcha was significantly (P<0.05) higher than at Dugda Bora district. However, average family size did not differ (P>0.05) between the two districts.

In both districts majority (45%) of the household heads had attended primary school education while 18% of the respondents were illiterate (Table 2). The number of illiterate people is higher at Adami Tullu Jidokombolcha compared with Dugda Bora district.

Landholding and land use pattern

In this study, it was observed that all farmers owned land in both districts. The overall average private land holding per household was 4.2 ha, out of which 3.4 and 0.8 ha of land were allocated for crop production and grazing, respectively (Table 3). The lowest share of land used for grazing was in Dugda Bora district. In both districts, hay making from grass as animal feed was rare and privately owned grazing land plus contract/rented lands were used as grazing resources during the heavy rainy seasons. Major crops grown in both districts included wheat, barley, *tef*, maize and haricotbean. The largest proportion of land per household was allotted to maize crop.

Livestock population, herd structure and purpose of livestock rearing

Almost all cattle breeds in both districts were indigenous types. Large herds were kept to maintain draught oxen related to the larger cropland. In addition, due to risks

Table 4. Herd size and herd structure (Mean ±SE) per household in the Adami Tullu Jidokombolcha and Dugda Bora districts, Ethiopia.

Livestock species	Districts			
	ATJ	Dugda Bora	ATJ (TLU)	Dugda Bora (TLU)
Cattle (total)	18.4±3.0	20.4±2.8	11.9±1.7	12.9±1.6
Cows	5.6±0.9	6.0±0.8	4.5±0.8	4.8±0.7
Oxen	3.8±0.5	3.9±0.5	4.2±0.6	4.3±0.5
Heifers	3.0±0.6	3.3±0.7	1.5±0.3	1.7±0.4
Bulls	0.6±0.1	0.9±0.2	0.7±0.1	0.9±0.2
Calves	5.3±1.2	6.4±1.1	1.1±0.2	1.3±0.2
Sheep	2.3±0.8	8.1±3.1	0.2±0.1	0.8±0.3
Goats	14.5±2.2	10.8±1.8	1.5±0.4	1.1±0.2
Horses	-	0.2±0.1	-	0.1±0.0
Donkeys	3.4±0.8	2.1±0.3	1.7±0.4	1.1±0.2
Total herd size	**15.3±2.2**		**16.0±2.0**	

ATJ = Adami Tullu Jidokombolcha, TLU = Tropical Livestock Unit.

Figure 1. Pairing a donkey with an ox for plowing around Ziway (Adami Tullu Jidokombolcha district).

and uncertainties of crop agriculture associated with drought and other factors, farmers in these areas always keep large herds of cattle. The average livestock herd size per household was slightly higher in Dugda Bora than Admi Tullu Jidokombolcha district (Table 4). The average number of donkeys and goats was somewhat larger in Adami Tullu Jidokombolcha compared to Dugda Bora districts. Donkeys in both districts were used mainly for pack and pulling carts. Recently a few farmers were seen pairing a donkey with an ox for plowing during sowing periods in Adami Tullu Jidokombolcha district mainly due to shortage of draught oxen (Figure 1).

Seasonal availability of feed resources

In both districts natural pasture and crop residues were the main feed resources. Commonly available feed resources across the different periods of a year are presented in Table 6. Natural pastures were the main feed resources during the main rain season (July to September). Stubbles of haricot bean, wheat, *tef*, barley and maize were also the major feed resources during the season after the main rain season (October to December). Weeds and maize thinning also contributed not much less. In the dry period (in most cases from January to June), crop residues like maize stover, wheat straw, *tef* straw, haricot bean straw and barley straw were the main feed resources. The wetlands around Lake Ziway were as important as crop residues in this period when water level was low.

The total estimated feed dry matter (DM) production per farm in Adami Tullu Jidokombolcha and Dugda Bora districts is shown in Table 5. The major feed resources contributing to the dry matter produuction in the two districts were natural pasture, crop residues and crop

Table 5. Estimated dry matter production (t), per annum per farm at Adami Tullu Jidokombolcha and Dugda Bora districts, Ethiopia.

Feedstuffs	Districts	
	ATJ	**Dugda Bora**
Crop residue	DM (t)	DM (t)
Wheat straw	1.7	1.7
Barley straw	0.9	0.7
Tef straw	0.2	0.8
Haricot bean straw	0.8	0.5
Maize stover	4.3	5.2
Crop stubbles	1.9	1.9
Grass		
Natural pasture	3.7	2.1
Total	**13.5**	**12.9**

Table 6. Feed resources availability across the different months of the year in both Adami Tullu Jidokombolcha and Dugda Bora districts, Ethiopia.

Feed sources	Months											
	S	**O**	**N**	**D**	**Ja**	**F**	**Ma**	**A**	**M**	**J**	**Ju**	**Au**
Natural pastures	■										■	■
Crop stubbles		■	■	■								
Crop residues							■	■	■	■		
Weeds and maize thinning	■										■	■
Natural pasture on wetlands around Lake Ziway						■	■	■	■			

■ The feed resource mentioned is available in the specified month/months. S = September, O = October, N = November, D = December, Ja = January, F = February, Ma = March, A = April, M = May, J = June, Ju = July, Au = August

stubbles. The largest proportion of dry matter was obtained from crop residues in both districts. Among crop residues, maize stover represented the largest share of dry matter production. The total DM estimated per farm per annum was 13.5 and 12.9 t at Admi Tullu Jidokombolcha and Dugda Bora districts, repectively. This total annual DM met only 81 and 80% of the total livestock requirement per annum per farm in Admi Tullu Jidokombolcha and Dugda Bora districts, repectively.

DISCUSSION

It is more often, observed that polygamy type of marriage is common in the Central Rift Valley. Similarly, a study by Agajie et al. (2005) indicated that having many wives is one of wealth indicators and commonly practiced type of marriage in the Central Rift Valley. The large family size in both districts could be related to the relatively labour intensive diversified farming activities and the weak family planning services.

Relatively, large number of illiterate people observed in the current study could be associated with lack of access to schools in these areas. Education plays vital role to adopt and promoted new technologies to the user. Moreover, it was explicitly indicated that farmers with high education levels adopt usually new technologies more rapidly than lower educated farmers (Ofukou et al., 2009). In both districts, a large number of herds were kept to maintain draught oxen related to the larger cropland. In addition, due to risks and uncertainties of crop agriculture associated with drought and other factors, farmers in the two districts observed to keep large number of indigenous livestock species. Particulrly, where crop failure is frequent due to poor rainfall, livestock are asset for the community and used as risk aversion (Ulfina et al., 2005). The larger number of goats and donkeys observed at Adami Tullu Jidombolcha district may be attributed to the availability of more browse species for goats and a number of activities performed by donkeys. The major feed resources contributed to the dry matter produuctio in the two districts are natural pasture, crop residue and crop stubbles. Negative balance of DM requirement observed

in the current study agrees with earlier works reported for different areas (Adugna and Said, 1994; Tessema et al., 2003). However, Sisay (2006) reported surplus DM supply than the total annual livestock requirement in northwestern part of Ethiopia.

Conclusion

Due to farm power requirement for traction, household heads in Admi Tullu Jidokombolcha and Dugda Bora districts keep a large number of indigenous cattle herd. Crop residues and natural pasures are the major feed resources in dry and wet seasons, respectively. The total annual dry matter does not meet the total livestock requirement per annum per farm in both districts. Further research and development work is recommended to alleviate feed shortage through different options such as utilization of non-conventional feeds, development of improved forages with the use of irrigation and alternative means of crop residue utilization.

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