

Participatory evaluation of herbage composition, biomass yield, and management practices of natural grazing lands in Sidama highlands of southern Ethiopia

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Introduction

Natural grazing land is the dominant source of feed for ruminant livestock in Ethiopia (Alemayehu, 2003; Zewdie and Yoseph, 2014). However, the production capacity and quality of natural grazing lands has been deteriorating over time and could not support optimum livestock production. Overgrazing the natural grazing lands due to poor grazing land management is among the major contributing factors (Alemayehu, 2003). Although previous studies focused on the evaluation of native grass lands it was either limited to arid and semi-arid agro-ecology or undertaken under different settings (Ayana, 2010; Diriba *et al.*, 2012). Moreover, it did not involve the community in the evaluation process. Natural grazing lands are spatially and temporally heterogeneous (Eaton *et al.*, 2011) and its composition varies with altitude, rainfall, soils, cropping intensity, and grazing land management (Alemayehu, 2003). Thus, understanding the current status of natural grazing lands is important to design pertinent strategies to improve the condition of the grazing land and thereby ensure sustainable utilization. The present study, therefore, examined botanical composition, biomass yield and management practices of natural grazing land under sub-humid and cool humid agro-climatic zones of Sidama highlands.

Materials and Methods

The study was conducted in 3 districts (Arbegona, Bona zuria and Bensa) of Sidama zone, Southern Ethiopia. Multi-stage stratified sampling technique was employed to select study sites (districts and agro-ecology) and households. Thus, the districts were selected purposively based on the potential high value livestock and irrigation commodities by the Livestock and Irrigation Value Chain for Ethiopian Smallholders (LIVES) project through the involvement of stakeholders (www.lives-ethiopia.org). Districts were stratified into agro-climate where cool humid and sub-humid were selected purposively based on its coverage. This was followed by selection of peasant association (purposively) and households (randomly). Data were collected using Focus Group Discussion (FGD), questionnaire survey, and direct observation and measurements. The dry matter content of the samples from the natural grazing lands was determined following standard procedure. Descriptive statistics and the General Linear Model Procedure of SPSS (Statistical Package for Social Science) were employed to analyze the data.

Results and Discussion

The grazing lands in Sidama highlands of southern Ethiopia are distributed across the different topographical settings (upstream plateau, middle stream slopping lands and downstream flood plains) prevalent in the study area. Thus, the higher (55.3%) proportion of grazing lands was located in middle stream slopping lands followed by upstream plateaus (30.7%) and downstream flood plains (13.9%). Although there were different grasses species listed by the community, *Pennisetum* and *Cynadon* species were reported by the community as the most preferred grass types (desirable) by livestock. However, according to focus group discussants, the proportion of these grasses has been decreasing over time. On the other hand, *Trifolium species* were the dominant legume species reported by the respondents. Although there were different weed types, *Argemone mexichne* was reported as the most important pasture weed that limits biomass production and intake by livestock. The overall mean (\pm s.e) total biomass yield from natural grazing land during the second harvesting season (October-November) was 1.15 ± 0.26 ton/ha. It was higher for sub-humid (1.26 ± 0.29) compared to cool humid agro-climate (0.67 ± 0.55). The total biomass yield was influenced by enclosure ($p < 0.05$) where enclosed grazing area had higher total biomass yield (2.0 ± 0.51 tone/ha) compared to open grazing land (0.77 tone/ha). Similarly, total biomass yield harvested from downstream flood plains was higher ($p < 0.05$) than that harvested from upstream plateaus. Among the pasture constituents, the biomass yield composition of grass (1.77 ± 0.37 tone/ha) was higher and legume (0.37 tone/ha) was lower while sedge had moderate yield (1.15 tone/ha). The average size of grazing land per household in the study area was 0.67 ± 0.05 ha and it was higher for cool humid (0.95 ± 0.10) compared to sub-humid (0.53 ± 0.09) agro-

climate. The dominant form of grazing land in the study area is private while the contribution of communal grazing lands is marginal. Grazing land management practices employed in the study area included fencing (90%), seasonal grazing (62%), fertilizing with manure (20%) and weeding (93%). However, according to focus group discussants, the feed from grazing land is not sufficient to maintain their animals.

Conclusion

It is, therefore, concluded that the biomass yield from the grazing land in the study area is poor with poor combination of legumes and grass composition. Continuous grazing would aggravate the deterioration of palatable species and promote the growth of unpalatable species. Introduction of improved grazing land development interventions specific to Sidama highlands such as paddocking, weeding, top dressing with commercial fertilizer or compost, and rotational grazing are suggested to overcome the decrease in the proportion of palatable species and increase overall biomass yield.

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