Journal of Natural Sciences Research www.iiste.org
ISSN 2224-3186 (Paper) ISSN 2225-0921 (Online)
Vol.6, No.23, 2016

Grazing Management of Goats and Strategies to Alleviate Dry Season Feed Shortage in Pastoral and Agro-Pastoral Districts of South Omo Zone, Ethiopia

Tekleyohannes Berhanu
Southern Agricultural Research Institute, PO Box 6, Hawassa, Ethiopia

Girma Abebe
College of Agriculture, Hawassa University ,PO Box 5, Hawassa, Ethiopia

Jameroen Thingtham
Department of Animal Science, Faculty of Agriculture, Kasetsart University,
Bangkok 10900, Thailand

Sayan Tusdri
Department of Agronomy, Faculty of Agriculture, Kasetsart University,
Bangkok 10900, Thailand

Somkiert Prasanpanich
Department of Animal Science, Faculty of Agriculture, Kasetsart University,
Bangkok 10900, Thailand

The research is financed by Rural Capacity Building Project, Ministry of Agriculture and Rural Development of Ethiopia.

Abstract
A survey was conducted in Hamer and Bena-Tsemay pastoral and agro-pastoral districts of South Omo zone, south western Ethiopia in between January to May 2011with the objective to describe grazing management of goats and strategies to alleviate dry season feed shortage. Data were collected from the two districts by informal and formal survey methods using focused group discussion and semi-structured questionnaire administered to 250 households. Natural pastures from rangelands are major feed sources for goats. The households have different grazing sites and herd management strategies for cattle and small ruminants. Cattle graze on communal rangelands far away from the homesteads and herded by young boys who live in camps around the grazing site. On the other hand, sheep and goats, including a few lactating cows and some sick animals, graze in community rangelands around the homesteads. In Hamer and Bena-Tsemay districts, 85 and 46% households co-graze sheep and goats which are usually herded by small boys or girls. In both districts, the hot dry season (November to February) is the period of feed scarcity and during which high mortality of goats have been reported. Mobility is the main strategy for the households to alleviate dry season feed shortage and tree lopping is the common practice for supplementation of goats during the dry season.
Keywords: Grazing management, Feed shortage, Goats, South Omo zone

1. Introduction

Feed resources are a major component of economic animal production in various animal enterprises. Feed availability and efficiency of use in specific agro-ecological zones and in smallholder production systems dictate to a very large extent the performance of both ruminants and non-ruminants. In Ethiopia, generally, green fodder (grazing) is the major feed source (about 39 percent) followed by crop residues (3 percent). Hay and by-products are also used as animal feeds which comprising about 12 and 3 percent of the total feeds, respectively. Moreover, very small amount of improved feed (like alfalfa, only about 1 percent) is being used as animal feed and other types of feed account about 12 percent in the country (CSA, 2012).

The major constraints of sheep and goat production related to nutrition and feeding in Ethiopia are inadequate feed supply, mainly due to small land-size and overstocking brought about by the shrinking amount of land reserved for grazing and the low feeding value of available feed resources resulting in low efficiency of utilization. This is aggravated by seasonal availability of forage and crop residues in the highlands and by recurrent and prolonged drought in the lowlands (Yami, 2008). According to Mengistu (1985) the strategy for feed improvement would incorporate improvement of feed availability and quality. Moreover, matching sheep and goat production systems to available feed resources and more efficient use of agricultural and industrial by-products as sources of feed have been suggested as a strategy for ensuring appropriate nutrition of small ruminants in the country (Yami, 2008). However, the development of appropriate solutions and feeding

techniques requires investigation on the constraints encountered by farmers in the field and fully exploration and characterization of the intervention zone (Salem and Smith, 2008). The objective of the current study is to describe grazing management and Feeding strategies to alleviate dry season feed shortage for goats in pastoral and agro-pastoral areas of South Omo zone, south western Ethiopia.

2. Material and Methods

2.1. Descriptions of the studied area

The study was conducted in Hamer and Bena-Tsemay pastoral and agro-pastoral districts of South Omo zone. The districts are located between 04° 59.00″ and 05° 58.40″ N and 36° 12.45″ and 37° 30.25″ E in the Southern Nation, Nationalities and People's Region (SNNPR) of Ethiopia. The climate of the districts is hot to warm semiarid with altitudinal variation of 500 to 1800 meters above sea level. Rainfall in the districts is bimodal, the main rain occurring in March to May and a short rain occurs in September to October (Fig. 1 and 2).

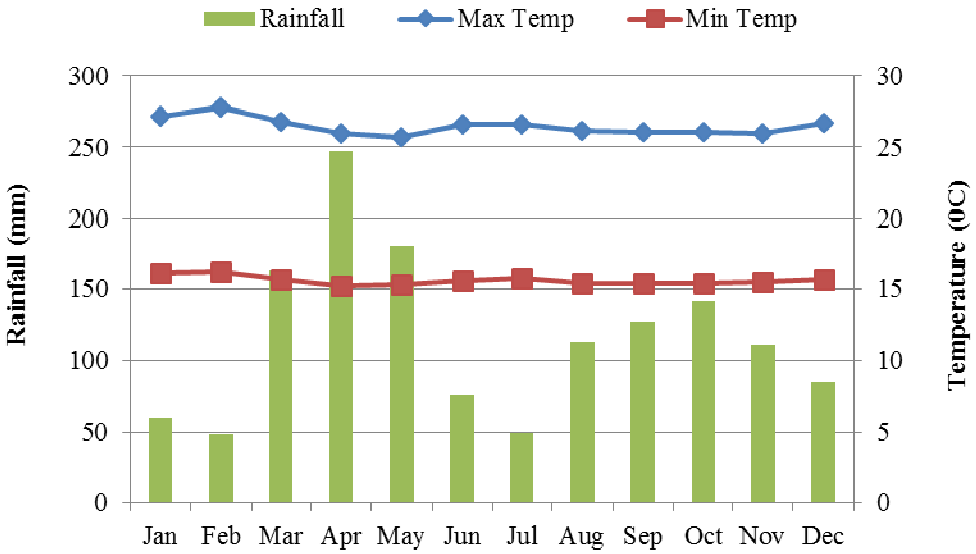

Figure 1. Monthly average rainfall and temperature (2000–2010) at Keyafer, Bena-Tsemay district (NMA, 2011).

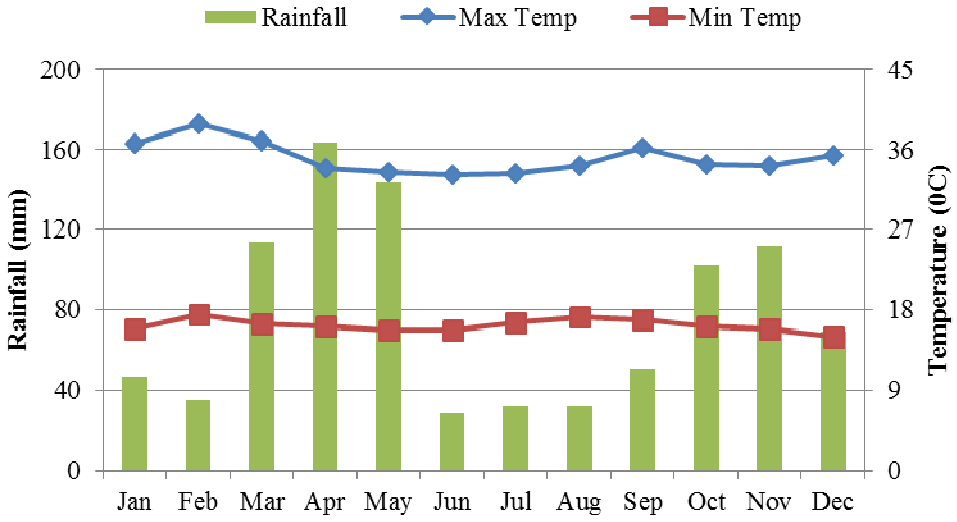

Figure 2. Monthly average rainfall and temperature (2000–2010) at Dimeka, Hamer district (NMA, 2011).

2.2. Data collection and analysis

After selection of the two districts namely; Hamer (representing the pastoral area) and Bena-Tsemay (representing the agro-pastoral area) a two stage sampling technique was used (Bethlehem, 2009). In the first stage, Kebele's (lowest administrative sub-units) and villages were selected from each district based primarily on distribution of ethnic groups and population of goats. In the second stage, respondent households were selected

randomly using systematic sampling procedures from the selected villages (three to five respondents per village). The distribution of households in each district was presented on Table 1. Information on households livelihood sources, grazing management of goats, number of grazing sites, grazing distance for goats from homesteads, the time spent by goats on grazing per day, months of feed shortage or surplus for grazing goats, strategies to alleviate dry season feed shortage, feed conservation and supplementation practices (during drought or shortage of grazing) and fattening practices for goats were collected from January to May 2011 through group discussions using structured questionnaire administered to knowledgeable goat producers, community leaders and key informants. Moreover, a secondary data pertinent for the study was collected from relevant district offices. The collected data were analyzed using descriptive statistics (SPSS, 2007).

Table 1. Distribution of the households in different sampling units (in numbers)

	Sampling unit[1]			
District	Kebele[2]	Village	Households selected	Ethnic groups interviewed
Hamer	38 (9)	217(27)	122	Hamer, Arbore
Bena-Tsemay	31 (9)	220(45)	128	Bena, Tsemay, Birale, Ari
Total	69(18)	437(72)	250	

[1] Numbers in parentheses represent selected sampling units (households)

[2] Lowest administrative sub-units

3. Results

3.1. Grazing management of goats

The households have different grazing sites and herd management strategies for cattle and small ruminants. Cattle graze on communal rangelands far away from the homesteads and herded by young boys who live in camps around the grazing site. On the other hand, sheep and goats, including a few lactating cows and some sick animals, graze in community rangelands around the homesteads. In Hamer and Bena-Tsemay districts, 85 and 46% households co-graze sheep and goats which are usually herded by small boys or girls. Cattle are usually herded and separated from small ruminants since they travel long distances for grazing. According to the respondents, goats spent 8 to 10 hours per day for grazing. Suckling kids were retained within the household's enclosure during the day time and provided with stubbles or tree leaves but confined in the evening and/or in the morning in a separate kraal until the does are milked.

Table 2. Grazing type, sites and distances from homesteads in the studied districts as reported by the households

	Hamer (n=122)		Bena-Tsemay (n=128)		Overall (n=250)	
	Frequency	%	Frequency	%	Frequency	%
Type of grazing						
Communal	90	73.8	103	80.5	193	77.2
Private	17	13.9	15	11.7	32	12.8
Other	15	12.3	10	7.8	25	10
Number of grazing sites						
1 to 2	72	59.0	91	71.1	163	65.2
3 to 5	39	32	30	23.4	69	27.6
>5	11	9.0	7	5.5	18	7.2
Distance of grazing sites (km)						
1 to 5	64	52.4	83	64.8	147	58.8
5 to 10	19	15.6	29	22.6	48	19.2
10 to 20	23	18.8	16	12.5	39	15.6
>20	16	13.1	0		16	6.4

3.2. Strategies to alleviate dry season feed shortage

The seasonal feed calendar in the study districts was presented on Table 3. In Hamer and Bena-Tsemay districts, 83 and 80% of households, respectively, stated that natural pastures from rangelands (pasture grasses, legumes, fodder tree and shrubs) are major feed sources for livestock. Some agro-pastoral households in the studied districts also use crop residues mainly from maize and sorghum harvests and graze their livestock on stubbles after crop harvests. Feed shortage and high mortality of kids and adult goats in both districts have been reported during the hot dry season (November to February).

Table 4 summarizes the strategies suggested by key informants to alleviate dry season feed shortage in the studied districts. Mobility is the main strategy for the households to alleviate dry season feed shortage. During times of long dry season (November to February), when feed and water becomes critical, pastoral household's move their livestock (including sheep and goats) towards the big rivers Woyto, Mago or Omo in search of feed and water. A few pastoral households have forage enclosures to supplement animals. Tree lopping is the common practice to supplement goats during the long dry season for 49 and 32% of households in Hamer

and Bena-Tsemay districts, respectively.

Feed supplementation practices by households in the studied districts was presented on Table 5. Supplementation of concentrates is not familiar for most of the households and some of them stated that concentrate is unaffordable due to the large number of goats they have. However, crop by-products and food left over are available for fattening animals especially in agro-pastoral areas. Pastoral households in Hamer district supplement a local salt called 'kuti' once per week for goats, especially when goats get sick. However, greater proportions of households supplement salt in Bena-Tsemay (22.6 vs. 7.4 %) and practice goat fattening (40 vs. 28%) compared with Hamer district (Table 5).

Table 3. Seasonal feed calendar in the study districts as reported by the households

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Rainy season			Xxx	Xxx	Xxx			X	xx	Xx		
Feed availability		X	Xxx	Xxx	Xx	x	X	X	xx	Xx	x	
Pasture grasses and legumes			Xxx	Xxx	Xxx	x	X	X	xx	X		
Fodder tree and shrubs				Xxx	Xxx	xx	Xx	Xx	xx	Xx	x	
Crop residues (maize, sorghum, etc.)							Xxx	Xxx	xxx			
Feed shortage	Xxx	Xxx	X							X	xx	xxx
Kids mortality	Xxx	Xxx	Xx								xx	xxx
Adult mortality	Xxx	Xxx	Xx	X							x	xxx

Where: x= Low; xx= Medium; xxx= High

Table 4. Strategies suggested by key informants to alleviate dry season feed shortage in the studied districts

Strategies	Current practice	Major Constraint	Suggested solution
Mobility	Communal grazing	Ethnic conflict	Government intervention to ease conflicts
Reduce livestock numbers	Sale	Lack of market	Facilitate marketing
Use of Forage enclosures	Grazing/cut and carry	Limited enclosures, over-grazing	Establishment of enclosures on key sites and promote proper use
Use of fodder tree, shrubs and other supplements	Tree lopping	Over-use, lack of alternative feeds and feeding systems	Training and introduction of suitable feeds and feeding systems
Range/pasture rehabilitation, conservation and development	Communal grazing	Water shortage, poor soil fertility, over-grazing and lack of suitable technologies	Training on proper rangeland management and introduction of suitable technologies

Table 5. Feed supplementation practices in the studied districts as reported by the households

Practice	Hamer (n=122)		Bena-Tsemay (n=128)		Overall	
	Frequency	%	Frequency	%	Frequency	%
Supplementation						
Feed[1]	60	49.2	41	32.0	101	40.4
Mineral/salt	9	7.4	29	22.6	38	15.2
Fattening[2]	34	27.9	51	39.8	85	34
Crop cultivation	122	100	128	100	250	100
Feed conservation	3	2.5	42	32.8	45	18

[1] Tree lopping

[2] Tree leaf, crop by-products and food left over

4. Discussions

The present study showed that rangeland is the major feed source for the households and availability of grazing was dependent on the rainfall in the study districts. Similar feed sources and grazing pattern and stock management/movement exists in Borana rangelands of south Ethiopia (Tolera and Abebe, 2007). However, a decrease in rangeland and change in vegetation composition due to frequent droughts, overgrazing, and expansion of cultivation is posing a serious threat to livestock production in South Omo rangelands (Carr, 1998; Admasu *et al.*, 2010). Availability and quality of grazing and browse resources in the pastoral areas of Ethiopia

vary with altitude, rainfall, soil type and cropping intensity and the pastoral zones are characterized by dense thorn bush with a low carrying capacity (Mengistu, 1985). Moreover, it has been reported that poor management of rangelands, inappropriate grazing management, rangeland fires and droughts limit the availability of fodder to ruminants in the country (Angasa, 2002; Benin *et al*., 2004; Gemedo *et al.*, 2006).

The present study indicated that mobility is the main strategy of households in times of feed shortage. Similar strategies have been used by pastoralists in the southern and eastern rangelands of Ethiopia (Tefera *et al.*, 2007; Tolera and Abebe, 2007; PCDP, 2008). However, it has been reported that tribal conflicts as a consequence to competition for water and grazing and the infestation of the forage abundant forests in Omo and Woyto River basins with Tsetse flies are limiting the movement of livestock in south western Ethiopia (Strecker, 1976; Ayalew, 1995; Turton, 1995). The future settlement of pastoral households and irrigation projects due to increase in demographic pressures from the highlands and the resulting changes in the socio-economic environment may be of potential threats to the pastorals since reduced mobility of herds introduces a severe constraint on animal productivity, with repercussions on the welfare of pastoral communities (Hary and Schwartz, 2002) unless some adaptive systems followed (Walker and Janssen, 2002).

Moreover, to sustain the pastoral production systems in south western Ethiopia, the current condition of communal rangeland should be improved through rangeland rehabilitation, conservation and proper management. Among others, resting of the communal grazing areas, proper grazing management, strengthening of privately owned enclosures as well as establishment of community based enclosures in some key sites are very essential (Admasu *et al.*, 2010). In the semi-arid region of Tigray, north Ethiopia, rehabilitation of degraded communal grazing lands is implemented through a network of exclosures constructed since the early and late 1990s proved successful and leading to increased grass and browse production in the region (Yayneshet *et al.*, 2009).

The current study as well described the supplementation practices of the households as a strategies to alleviate dry season feed shortage of animals. In arid areas strategies such as matching livestock numbers with availability of feed resources, use of fodder tree and shrubs, use of feed or urea/molasses blocks or licks, conservation of forages, improvement of crop residues and efficient utilization of agricultural and industrial by-products as sources of feed and encouraging increased intake of animals have been reported (Anderson, 1985; Houtert and Sykes, 1999; Ahmed *et al.*,2001; Rubanza *et al.*, 2007; Salem and Smith, 2008; Yami, 2008).

In the current study greater proportion of households in Bena-Tsemay district fattening goats than Hamer district. This could be associated with the higher feed availability and the proximity of Bena-Tsemay district to major roads, zonal towns and to major markets which may have encouraged the households in the district to perform more fattening activities to have higher prices from sale of their goats. Therefore, it seems feasible to promote improved feeding technologies and/or goat genotypes targeting such areas/households. In north Kenya, smaller percentage of the pastoral/extensive than the smallholder farmers practice improved feeding systems (Kosgey et al., 2008).

5. Conclusion and recommendation

Range plants comprising browses, grasses, herbaceous legumes, and forbs are the major feed sources for livestock in the study areas. In both districts, the hot dry season (November to February) is the period of feed scarcity and during which high mortality of goats has been reported. Mobility is the main strategy for the households to alleviate dry season feed shortage but movement of livestock within the districts was occasionally constrained by ethnic conflicts. A few pastoral households have forage enclosures to supplement animals. Tree lopping is the common practice for supplementation of goats during the dry season. Crop residues and some food left over are also available for supplementing animals especially in the agro-pastoral areas. To sustain goat production in the districts efficient utilization of grazing resources through proper rangeland measures is required. Moreover, the efficiency of goat production could be increased by optimizing the breeding season of goats with the availability of feed resources.

6. Acknowledgment

For the financial support provided, the author is grateful to the Rural Capacity Building Project, Ministry of Agriculture and Rural Development of Ethiopia. Anonymous reviewers are also thanked for providing constructive comments and suggestions that helped in improving this paper.

7. References

Admasu, T., Abule E. and Tessema Z. (2010). Livestock-rangeland management practices and community perceptions towards rangeland degradation in South Omo zone of Southern Ethiopia. Available source: http://www.lrrd.org/lrrd 22/1/tere22005.htm, January 23, 2012.

Ahmed, M.M.M., El Hag F.M., Wahab F.S. and Salih S.F. (2001). Feeding strategies during dry summer for lactating desert goats in a rainfed area under tropical conditions. Small Rumin. Res. 39: 161−166.

Anderson, F.M. (1985). Farmer circumstances in Ethiopia and the improvement of animal feed resources In J.A.

Kategile, A.N. Said, and B.H. Dzowela (eds). Proceedings of the second Pastures Network for Eastern and Southern Africa (PANESA) workshop, held at the International Laboratory for Research on Animal Diseases, 11-15 November 1985, Kabete, Nairobi, Kenya.

Angasa, A. (2002). The effect of clearing bushes and shrubs on range condition in Borana, Ethiopia. Tropical Grasslands. 36: 69−76.

Ayalew, G. (1995). The Arbore of Southern Ethiopia: A study of Inter-Ethnic relations, social organization and production practices. MA Dissertation. Department of Sociology, Anthropology and Social Administration, College of Social Sciences, Addis Ababa University.

Benin, S., Ehui S. and Pender J. (2004). Policies affecting changes in ownership of livestock and use of feed resources in the highlands of northern Ethiopia. J. Afr. Economies. 13(1): 166−194.

Bethlehem, J. (2009). Applied Survey Methods: a statistical perspective. John Wiley and Sons, Inc. Publication. U.S.A.

Carr, C.J. (1998). Patterns of vegetation along the Omo River in southwest Ethiopia. Plant Ecol 135: 135–163.

CSA (Central Statistical Agency). (2012). Agricultural Sample Survey 2011/12 Volume II: Report on livestock and livestock characteristics (private peasant holdings). Statistical bulletin 532, CSA, Addis Ababa, Ethiopia.

Gemedo, D., Maass B.L. and Isselstein J. (2006). Encroachment of woody plants and its impact on pastoral livestock production in the Borana lowlands, southern Oromia, Ethiopia. Afr. J. Ecol. 44: 237−246.

Hary, I. and Schwartz H. (2002). Effects of seasonal breeding on productive performance of pastoral goat herds in northern Kenya: a longitudinal analysis of growth in kids and body weight development of does. J. Arid Environ. 50: 641–664.

Houtert, M.F.J. and Sykes A.R. (1999). Enhancing the profitability of pasture-based dairy production in the humid tropics through improved nutrition. Preventive Veterinary Medicine. 38: 147−157.

Kosgey, I.S., Rowlands G.J., van Arendonk J.A.M. and Baker R.L. (2008). Small ruminant production in smallholder and pastoral/extensive farming systems in Kenya. Small Rumin. Res. 77: 11–24.

Mengistu, A. (1985). Feed resources in Ethiopia. In J.A. Kategile, A.N. Said, and B.H. Dzowela (eds). Proceedings of the second Pastures Network for Eastern and Southern Africa (PANESA) workshop, held at the International Laboratory for Research on Animal Diseases, 11-15 November 1985, Kabete, Nairobi, Kenya,

NMA, (2011). Keyafer, Dimeka, Turmi and Jinka stations 2000 −2010 weather report, National Meteorological Agency, Hawassa Branch Office, Hawassa, Ethiopia.

PCDP (Pastoral Community Development Project). (2008). Baseline Survey of 55 Wereda's of PCDP II. Addis Ababa, Ethiopia.

Rubanza, C.D.K., Shem M.N., Bakengesa S.S., Ichinohe T. and Fujihara T. (2007). Effects of Acacia nilotica, A. polyacantha and Leucaena leucocephala leaf meal supplementation on performance of Small East African goats fed native pasture hay basal forages. Small Rumin. Res. 70: 165–173.

Salem, H.B. and Smith T. (2008). Feeding strategies to increase small ruminant production in dry environments. Small Rumin. Res. 77: 174–194.

SPSS (Statistical Package for Social Sciences). (2007). SPSS 15.0. Student Version for Windows, (Prentice Hall)

Strecker, I.A. (1976). Traditional life and prospects for socio-economic development in the Hamer administrative district of southern Gamu Gofa – A Report to the Relief and Rehabilitation Commission of the Provisional Military Government of Ethiopia. Available source: http://www.unimainz.de/Organisationen/SORC/ fileadmin/texts/Traditional%20life%20and%20Prospects.pdf

Tefera, S., Snyman H.A. and Smit G.N. (2007). Rangeland dynamics in southern Ethiopia: (1) Botanical composition of grasses and soil characteristics in relation to land-use and distance from water in semi-arid Borana rangelands. J Environ Manage 85: 429 – 442.

Tolera, A. and Abebe A. (2007). Livestock production in pastoral and agro-pastoral production systems of southern Ethiopia. Available source: http://www.lrrd.org/lrrd19/12/tole19177.htm, July 22, 2012.

Turton, D. (1995). Pastoral Livelihoods in Danger-Cattle Disease, Drought, and Wildlife Conservation in Mursi land, South-Western Ethiopia. Oxfam (UK and Ireland), Oxfam Research Paper no. 12.

Walker, B.H., and Janssen M.A. (2002). Rangelands, pastoralists and governments: interlinked systems of people and nature. Phil. Trans. R. Soc. Lond. 357: 719−725.

Yami, A. (2008). Nutrition and Feeding of Sheep and Goats. In A. Yami and R.C. Merkel (eds). Sheep and Goat Production Handbook for Ethiopia. Ethiopia Sheep and Goat productivity Improvement Program (ESGPIP). Addis Ababa, Ethiopia.

Yayneshet, T., Eik L.O. and Moec S.R. (2009). Seasonal variations in the chemical composition and dry matter degradability of exclosure forages in the semi-arid region of northern Ethiopia. Anim. Feed Sci. Technol. 148: 12–33.