



Rangeland forage availability and management in times of drought – A case study of pastoralists in Afar, Ethiopia



Anna C. Treydte ^{a, b, *}, Andrea Schmiedgen ^a, Gebreyohannes Berhane ^c, Kidanie D. Tarekegn ^d

^a Agroecology in the Tropics and Subtropics, University of Hohenheim, Germany

^b Nelson Mandela African Institution of Science and Technology, Arusha, Tanzania

^c Veterinary Medicine and Agriculture, Addis Ababa University, Ethiopia

^d Werer Agricultural Research Center, EIAR Addis Ababa, Ethiopia

ARTICLE INFO

Article history:

Received 17 June 2015

Received in revised form

2 September 2016

Accepted 29 December 2016

Available online 5 January 2017

Keywords:

Cattle

Crop residues

Herbaceous and woody vegetation

Livestock

Natural resources

ABSTRACT

Many Eastern African rangelands comprise marginal land, where climatic conditions are poor, access rights are increasingly limited, and land degradation is progressing. We conducted participatory land use mapping and vegetation assessment to identify the most important rangeland locations and their condition in Afar, Ethiopia. Further, we conducted 79 interviews across six villages to assess pastoralist adaptation strategies during drought times. In the dry season, livestock feed resources represented rangelands far away from the village (in 76% of the cases) while 50% and 40% of pastoralists also used cake concentrates and crop residues, respectively. During the wet season, rangeland resources close to villages, albeit with rather low herbaceous cover (<25%), contributed 80% to livestock forage. In times of severe drought, migrating with livestock was the most common (70%) adaptation, in combination with purchasing feed (50%) while <40% of the pastoralists sold or slaughtered animals. Afar pastoralists applied little conservation and mitigation methods, most commonly they removed livestock pressure to allow the pasture to recover. Overall, pastoralists in Afar still strongly depended on natural rangelands and their resources. Hence, to manage these sustainably a monitoring scheme must urgently be established for investigating rangeland quality and resilience to drought and grazing pressure.

© 2017 Elsevier Ltd. All rights reserved.

1. Introduction

Marginal land is difficult to cultivate and threatened by desertification and soil erosion worldwide (Izzo et al., 2013; Mandal and Sharda, 2013; Zhao et al., 2013). While the demand for livestock products is increasing globally (McMichael et al., 2007), rangelands are degrading across the world due to poor rangeland management (e.g., Vetter and Bond, 2012; Li et al., 2013). Degradation and large cattle herds representing wealth to the livestock herder community have rapidly diminished grazing resources, for example in Ethiopia, South Africa and Argentina (Tadesse, 2001; Bennett et al., 2012; Kröpfl et al., 2013). With high grazing pressure in drylands,

nutritious grass species are disappearing and soil erosion and compaction often prevent fresh grass re-growth (e.g., Markakis, 2003; Palacio et al., 2014). Additionally, climatic conditions have worsened over the last decades; in the Afar region of Ethiopia, unpredictable rainfall and increasing drought intervals have had strong impact on livestock numbers, pastoralists' health and food security (USAID, 2011). The result has been a severe decline, particularly of breeding females, in herd size due to die-off (Angassa and Oba, 2007; Headey et al., 2012). Further, less than 2% of the land encompasses agricultural fields that can also supply crop residues for animal forage – and, thus, a semi-nomadic pastoralism prevails (ANRS, 2010). Additionally, this region has been challenged by various conflicts between different clans and tribes (e.g., Reuveny, 2007), rendering access to grazing lands and movement patterns increasingly difficult. Another problem is the rapid spread of invasive non-palatable plant species such as *Prosopis juliflora*, occupying large areas of the grazing lands (Rettberg and Müller-Mahn, 2012; Treydte et al., 2014). These phenomena

* Corresponding author. Agroecology in the Tropics and Subtropics, University of Hohenheim, Germany.

E-mail addresses: anna@treydte.com (A.C. Treydte), spondrea@gmx.net (A. Schmiedgen), g.berhane216@yahoo.com (G. Berhane), kdessalegn@yahoo.com (K.D. Tarekegn).

have led to undernourished livestock and a non-sustainable use of vegetation resources, making a further adaptation to drought and climatic change even more difficult. Pastoralists who have adapted their lifestyle to the dry environment in the Afar region for centuries are facing ever more difficult environmental and social conditions.

Opportunistic movements of livestock and trading grazing rights have been reported as adaptation strategies to drought in Africa (e.g., Swallow, 1994; Goodhue et al., 2005) and Australia (McAllister, 2012). The question remains whether supplementary feeding or rather conservative stocking rates are good adaptation strategies (Scoones, 1992; Aklilu and Wekesa, 2002; McAllister, 2012) and whether these strategies apply to Afar pastoralists. Despite various studies on pastoralism and drought consequences in Ethiopia (Abule et al., 2005a; Angassa and Oba, 2007; Hassen, 2008), little research has been done on the availability and use of natural resources, i.e., herbaceous and woody vegetation, for livestock in the Afar region. In Botswana, forage alternatives during drought times consisted of crop residues, commercial feed or even alternative income sources (Mogotsi et al., 2013) whereas not much is known about these alternatives in the Afar region. We expected that, due to the nomadic nature of pastoralists in Afar, alternative food resources such as crop residues, cake or hay storage are barely available for livestock in drought times. Therefore, we hypothesize that *during both non-drought and drought years, the main forage resource for livestock in the Afar region will consist of natural herbaceous and woody vegetation, i.e., grass and browse.*

Further, livestock composition and movement patterns have rarely been documented for the Afar region (Sonneveld et al., 2009). The forage availability in rangelands will determine where grazing and browsing patches are located. In general, one would expect that the availability of forage species is closely linked to the livestock preference; we wanted to test this so-called “ecological apparency hypothesis” (*sensu* Lucena et al., 2012). We expected that the demand for forage species by livestock, as stated by the pastoralists, would, therefore, resemble the relative abundance of the species in the rangeland. We therefore hypothesized that *the availability of forage plant species will show parallel patterns with the demand by the different livestock species.*

Further, vegetation status, i.e., low forage biomass production, has usually been used as indicators of a drought approaching by farmers in Botswana (Mogotsi et al., 2013). If pastoralists in Afar also use this indicator, we would expect that *a decrease in herbaceous vegetation biomass will lead pastoralists to use alternative forage resources or rangelands further away from their village.*

During a severe drought, it has been reported that livestock numbers drastically decline – pastoralists watch livestock die and little is done to reduce herd numbers by selling livestock (Kebebew et al., 2001; Angassa and Oba, 2007). This reduction of livestock populations can lead to an unintended resting period, which helps the landscape to recover (Müller et al., 2007). Further, cattle performance seems to be strongly related to rainfall, impacting grass biomass and composition in combination with long-term overgrazing (Fynn and O'Connor, 2000). We hypothesized that, *during severe drought, supplemental feed is provided only rarely and herds are not reduced in advance.*

Resting periods of the vegetation, particularly under adequate precipitation, have been shown to be crucial in Namibia (Müller et al., 2007). While agro-pastoralists and small-scale farmers in Ethiopia have established soil and water conservation and irrigation mechanisms to cope with drought (e.g., Awulachew et al., 2005; Beyene, 2009) conservation and mitigation strategies against drought by pastoralists, who are constantly on the move, are largely unknown. We expected that *rangeland conservation and restoration measures are rarely conducted by Afar pastoralists.*

Various studies have included the perception of the environment through local communities (Nabahungu and Visser, 2013; Özgüner et al., 2013). Our research focused on an assessment of the availability and management of rangeland forage resources by pastoralists in Afar. We further wanted to assess the current vegetation in the differently used rangeland regions (grazing and browsing sites), including vegetation cover, species diversity and the abundance of preferred and palatable plant species. We also investigated how Afar pastoralists react to severe drought and whether they use conservation methods to restore natural resources in their pasture lands. To answer these questions, we used interviews and conducted vegetation analyses in the field in combination with secondary data on livestock numbers and type.

2. Materials and methods

2.1. Study area

Our study was carried out at representative sites for the Afar region: study sites were located in and around six villages in the Chifra, Awra and Ewa districts (Table 1), where natural resources have recently experienced environmental and human induced stresses (ACCRA, 2012).

All districts face similar climatic challenges such as increasing temperatures and erratic rainfall patterns followed by other trends such as human population growth and rangeland degradation (ACCRA, 2012). The Afar regional state, located in northeastern Ethiopia, covers about 270,000 km² (CSA, 2008). It consists of five administrative zones (sub-regions), 32 districts, 28 towns, and 401 rural and urban villages (Fig. 1).

About 15% of the total land area of the Afar region is covered by grassland, 32% is shrubland, 2% represents woodland and <1% remaining forest areas while the vast area of the region (50%) is covered by exposed soil, sand or rock (Bureau of Finance and Economic Development, 1999). The region is characterized by arid and semi-arid climatic conditions with mean annual rainfall of 150–500 mm. The main rains (60% of annual rainfall) fall in June–September while short rainy showers occur in December and during March–April (Fig. 2).

Out of a population of roughly 1.4 million people, around 87% reside in rural areas, being mainly dependent on pastoral and agro-pastoral livelihood systems (CSA, 2008). Livestock species in the Afar region were mainly composed of cattle, goat, camels and sheep (Tilahun and Schmidt, 2012), varying strongly across regions (Table 1). The estimated number of cattle per household ranges from 7 to 10 and that of goat and sheep >10, while the overall number of livestock is still rising (Tilahun and Schmidt, 2012).

2.2. Study design

2.2.1. Interviews and vegetation survey

Interviews and vegetation assessment were conducted from October to November 2013, at the beginning of the dry season (Fig. 2). After meeting with the responsible Pastoralist Offices of each district, the villages were chosen based on their accessibility and nearby grazing area location. Semi-structured questionnaires were used to receive qualitative and quantitative data on pastoralist knowledge about livestock management and rangeland condition during drought periods. The questionnaires were in English and translated into Afar with the help of interpreters. In each of the three districts 9 to 15 households within two villages were examined. Households were chosen randomly with the agreement of the chairman and elders of each village. In total, 79 interviews were conducted; all of the respondents were livestock owners. The number of female and male interviewees was 15 and 64,

Download English Version:

<https://daneshyari.com/en/article/5744350>

Download Persian Version:

<https://daneshyari.com/article/5744350>

[Daneshyari.com](https://daneshyari.com)