Pastoralism: Research, Policy and Practice

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Examining local perspectives on the influence of climate change on the health of Hamer pastoralists and their livestock in Ethiopia

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Abstract

This study explores the perceived influence of climate change on the health of Hamer pastoralists and their livestock in south-western Ethiopia. A combination of focus group discussions and key informant interviews were conducted with Hamer communities as well as local health workers, animal health workers and non-governmental organisation (NGO) staff. Thematic framework analysis was used to analyse the data. Reductions in rangeland, erratic rainfall, recurrent droughts and loss of seasonality were perceived to be the biggest climate challenges influencing the health and livelihoods of the Hamer. Communities were travelling greater distances to access sufficient grazing lands, and this was leading to livestock deaths and increases in ethnic violence. Reductions in suitable rangeland were also precipitating disease outbreaks in animals due to increased mixing of different herds. Negative health impacts in the community stemmed indirectly from decreases in livestock production, uncertain crop harvests and increased water scarcity. The remoteness of grazing lands has resulted in decreased availability of animal milk, contributing to malnutrition in vulnerable groups, including children. Water scarcity in the region has led to utilisation of unsafe water sources resulting in diarrhoeal illnesses. Further, seasonal shifts in climate-sensitive diseases such as malaria were also acknowledged. Poorly resourced healthcare facilities with limited accessibility combined with an absence of health education has amplified the community's vulnerability to health challenges. The resilience and ambition for livelihood diversification amongst the Hamer was evident. The introduction of camels, increase in permanent settlements and new commercial ideas were transforming their livelihood strategies. However, the Hamer lack a voice to express their perspectives, challenges and ambitions. There needs to be collaborative dynamic dialogue between pastoral communities and the policy-makers to drive sustainable development in the area without compromising the values, traditions and knowledge of the pastoralists.

Keywords: Pastoralism, Climate Change, Animal health, Ethiopia

Introduction

Climate change, increasingly labelled a "climate emergency" (Carrington 2019), is a priority twenty-first century challenge. Described as unequivocal and occurring at an unprecedented rate, we are already seeing the repercussions of 1 °C of global warming across the world through more extreme weather, rising sea levels and diminishing arctic sea ice (IPCC 2018). The Intergovernmental Panel on Climate Change (IPCC) has reported various observed impacts of climate change including reduced quality and quantity of water resources, decreased crop yields, increased conflict and exacerbation of other stressors such as poverty (IPCC 2014). Described as a "threat multiplier" to famine (Butler 2014), climate change is predicted to increase frequency of droughts

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throughout Eastern Africa which in turn is expected to exacerbate food insecurity and reliance on food aid (Megersa et al. 2014; Abebe et al. 2012). Further, negative human health impacts such as increasing disease burden and expanding geographic range of infectious diseases, particularly vector-borne diseases such as malaria and visceral leishmaniasis and waterborne-disease such as diarrhoea, are expected with rising temperatures (Simane et al. 2016; Samson et al. 2011; Patz and Olson 2006). Whilst global health initiatives have significantly reduced the burden of diseases across the world, unmitigated climate change is predicted to reverse these positive gains (Watts et al. 2018).

Ethiopia, like many low-income countries, is disproportionally vulnerable to the adverse effects of climate change. The country is heavily dependent on rain-fed agriculture, which accounts for 46% of Gross Domestic Product (GDP) (World Bank 2008). With an estimated 80 million livestock, Ethiopia contains the largest livestock population in Africa (Bekele 2017). Low adaptive capabilities and climate-sensitive livelihood strategies such as pastoralism place the country in a susceptible predisposition for adverse outcomes of climate variation (National Meteorological Agency 2007; Thomas and Twyman 2005). The climate variations currently witnessed in Ethiopia are erratic rainfall, often occurring in the crop growing season and an increase in mean annual temperature of 1.3 °C from 1970 to 2006 (Amsalu et al. 2018; Simane et al. 2016). Averaged across the country, precipitation throughout Ethiopia has remained relatively stable over the last 50 years. However, large-scale trends are unlikely to reflect local conditions due to the high spatial and temporal variability of rainfall across the country (Keller 2009). Nonetheless, climate trend analysis has revealed that the "Belg", which is the main crop growing rainy season in Ethiopia, has declined by 15–20% since the mid-1970s (Funk et al. 2012). As 90% of the agricultural output is small-scale subsistence farming, climate variation may not only greatly impact the country's economy, but it may also be detrimental to livelihoods (Simane et al. 2016; World Bank 2010).

In Ethiopia, around 60% of all arid or semi-arid land in the country is used by pastoralist communities, who make up approximately 14% of the total population (Blau 2018; Gebeye 2016). Pastoralism is a complex livelihood strategy in which a population seeks an optimal balance between themselves, pastures and livestock in unpredictable environments (Nori et al. 2008). By practising an extensive and mobile livestock system in the drylands, pastoralists are able to achieve this optimal balance (Humanitarian Policy Group 2009). Pastoralism thrives on climate-sensitive arid and semi-arid terrain which ordinarily cannot be used for any other form of food acquisition (Schlee and Shongolo 2012). In Ethiopia, pastoralists are mainly found in the lowland regions of Afar, Oromiya, Somali and Southern Nations, Nationalities and Peoples (SNNP) (Pantuliano and Wekesa 2008). In these areas, mobility is "an ecological and economic necessity" (Nori et al. 2008, 8) as pastoral communities make maximum use of the available vegetation without destroying the environment in one area (Humanitarian Policy Group 2009).

Pastoralists and agro-pastoralists in tropical and subtropical dryland environments are some of the most vulnerable groups to changes in climate (Herrero et al. 2016; Enyew and Hutjis 2015; Pavanello 2009). Practising a livelihood strategy which is so heavily reliant on livestock means that any challenge facing their livestock will directly affect the community. Livestock and their products are consumed by pastoral households, sold to purchase foods and other necessities and held as social capital to insure against future shocks (Morton and Kerven 2013; Davies and Bennett 2007). Reliance on livestock for cash and nutrition means that pastoralists are extremely vulnerable to food insecurity, particularly during drought periods which cause dehydration, starvation and death of many livestock (Kimaro et al. 2018; Montavon et al. 2013). Many authors suggest that milk production in animals will be negatively affected by climate change (Mondal and Reddy 2018; Thornton et al. 2009), particularly in dairy cows (Rojas-Downing et al. 2017). This is projected to have a substantial impact on the nutrition of both young livestock and pastoralists themselves (Montavon et al. 2013; Nardone et al. 2010). Changes in climate are also likely to have adverse impacts on livestock health; however, there is considerably less research on this topic (Rojas-Downing et al. 2017). As well as climate pressures on livestock and livelihoods, marginalisation within political and social spheres has been thought to increase the vulnerability of pastoralists (Schlee and Shongolo 2012; Sandford 2011; WISP 2008; Markakis 2004). This includes a lack of respect for their traditional land rights (Sandford 2011; WISP 2008), with many national policies criticising pastoralism as a less productive and degrading use of the land (Reda 2014). This has led to many policies pursuing a strategy of settling pastoralists (UNEP 2015). Furthermore, many authors see pastoralists as a neglected group who lack access to basic services, including health services (Pavanello 2009; Markakis 2004).

Whilst previous studies have outlined the potential impact of climate change on health in Ethiopia, the majority of these studies aimed to correlate changing climate and disease patterns (Azage et al. 2017; Simane et al. 2016; Bambrick et al. 2015; Taye et al. 2015; Hagos et al. 2014). Studies which include a qualitative approach are scarce and focus on the perspectives of health officials or health students in the region (Nigatu et al. 2014;

Samson et al. 2011). A handful of studies on climate change have been conducted with pastoralists in Afar (Tsegaye 2013; Davies and Bennett 2007; Kassa 2001), Oromiya (Desalegn et al. 2018; Debela et al. 2015; Yilma et al. 2009) and SNNPR (Enyew and Hutjis 2015; Gebresenbet and Kefale 2012), although these have tended to focus on livelihood adaptations and coping strategies in relation to climate change. There is limited understanding of pastoralists' perception and experiences of climate change and its impacts on health in Ethiopia or elsewhere.

The Hamer people are one of multiple pastoralist ethnic groups found in the drylands of the South Omo Zone in the wider south-western SNNP Region (Tefera 2013). Cattle, goats and sheep make up the majority of their livestock composition. Cattle are often seen as the most important animal as they provide raw milk and blood which is vital for sufficient protein intake. Goats are reared mainly as a safety net or to show high social status and therefore often make up the largest proportion of the herd (Tschopp et al. 2010). Livestock are usually taken to graze in the rangelands by the herdsmen, leaving the women to take care of agrarian activities closer to settlements. Traditionally, the Hamer cultivate the grain sorghum, which has become a staple part of their diet (Tefera 2013). Hamer society is patriarchal. Male polygamy is very common, and one man may share a household with all of his wives and their children. Male elders hold the decision-making power and responsibility for settling disputes in their community (Tefera et al. 2016).

In this paper, we report an in-depth investigation into Hamer perspectives and experiences of the impact of climate change on (human and animal) health, through the lens of community members and health providers.

Study area

Hamer *woreda* is one of several administrative divisions in the South Omo Zone in south-western Ethiopia. This study was conducted in four of the 35 *kebeles* (the smallest administrative units of *woreda*) in Hamer *woreda*: Angude, Kolakeja, Shanko Kelema and Sinbele. These *kebeles* were chosen due to their topography and proximity to the town of Turmi where the researchers were based for the duration of fieldwork. Turmi is situated between latitudes $4^0.58'1''$ north and longitude $36^0.29'17''$ east (Fig. 1). Two of the *kebeles* (Shanko Kelema and Sinbele) are highland settlements and two (Angude and Kolakeja) are lowland settlements. Hamer *woreda* has a bi-modal seasonal cycle. Long rains (*Belg*) occur from February through to May and the short rains (*Meher*) from October to November (Abebe 2010). Hamer *woreda* was purposively selected for this study for multiple reasons. Firstly, the *woreda* is the homeland of the Hamer people who practise pastoralism and agro-pastoralism. Secondly, the *woreda* represents semi-arid and arid terrain which is highly vulnerable to the adverse effects of climate change. Thirdly, there are limited studies exploring the perspectives of pastoralists regarding the climate impact on health, including in the Hamer people. Lastly, one of the researchers has a rich history with the Hamer people, having completed ethnographical studies in recent years (Tefera et al. 2016; Tefera 2013, 2014); this allowed easier access to communities as relationships were already formed with local officials and also gave in-depth knowledge of local traditions and social norms.

Although pastoral groups in Ethiopia are similar, the topographic variety between pastoral areas and cultural diversity means there may be differences in experiences and perceptions of climate change. The findings should therefore not be generalised.

Methods

Grounded theory was used as a basis for this study. This naturalistic and iterative approach to research was selected as it allowed us to study a community in their natural social environment whilst understanding there are multiple interpretations of social reality (Bowling 2014).

Data collection

This research was undertaken in May–June 2019. Prior to arriving in Hamer *woreda*, the research team travelled to Jinka, the zonal administrative centre for the South Omo Zone. Topic guide contents were pilot tested informally through discussions with zonal health, agricultural and pastoral ministers (senior officials). This allowed the research team to examine the application of questions as well as gain an understanding of the current challenges facing the Hamer communities and other pastoral groups. Subsequently, the research team were able to review the topic guides, assessing the relevance of questions and adding follow-up questions to the guides.

Focus group discussions

Focus group discussions (FGDs) were selected as a form of primary data collection as they allow participants to explore and clarify their own views as well as highlight shared values, questions and knowledge (Krueger and Casey 2015; Howell 2013; Kitzinger 1995). One FGD was conducted in each of the four *kebeles*. Eligible participants were male and female pastoralists aged > 18 years, including community leaders, who were present in the *kebeles* at the time of the study team visit. Convenience sampling was used to select the participants. Focus group size of six to 12 participants is recommended to generate rich discussion (Braun and Clarke 2013; Howell

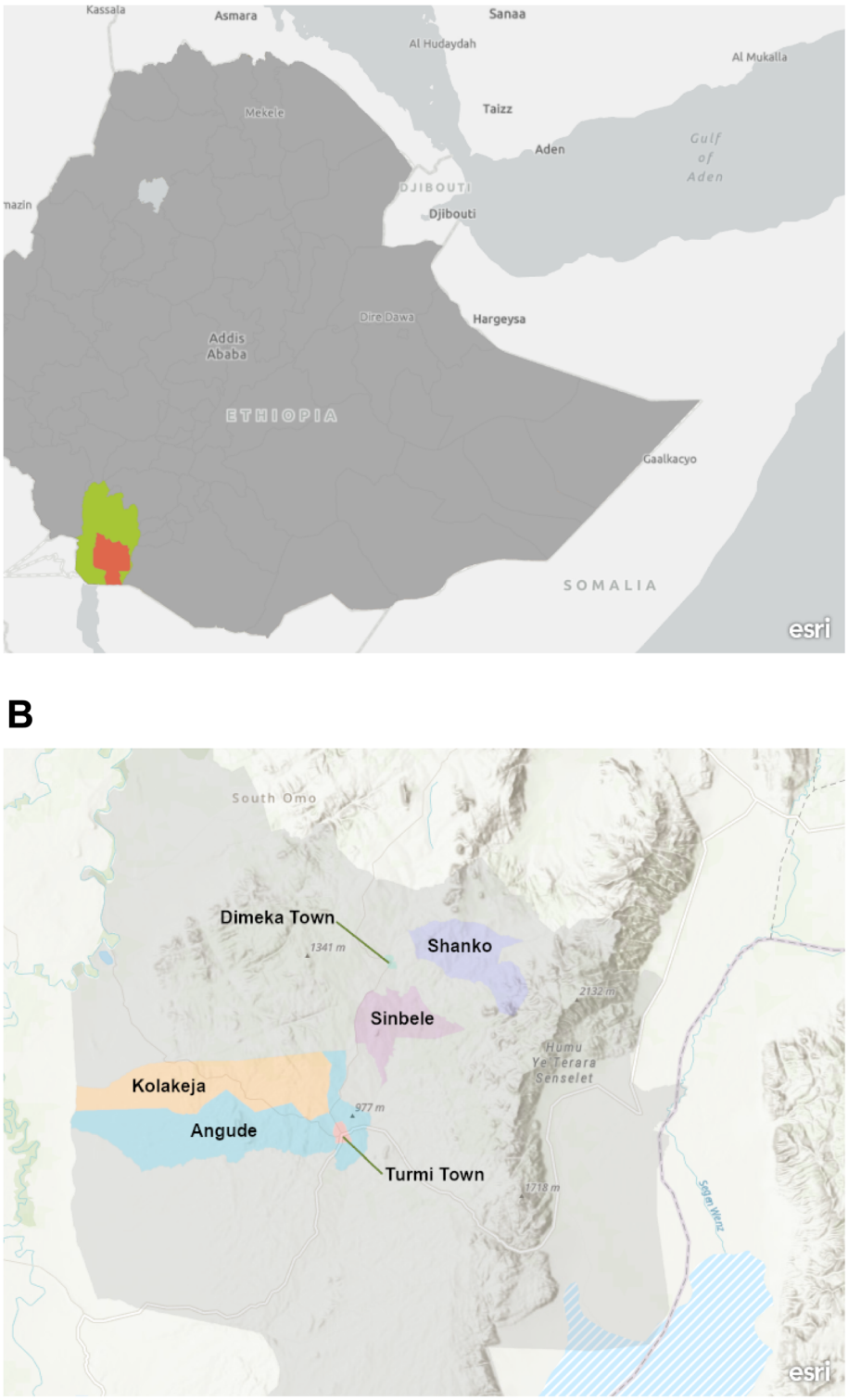

Fig. 1 **a** Map of Ethiopia displaying South Omo Zone (green) and Hamer *woreda* (red), the administrative division in which the research was undertaken. **b** Map of Hamer *woreda* displaying the four *kebeles* in which the research was undertaken. Figures created using ArcGIS online [Environmental Systems Research Institute]

2013) although many authors consider lower numbers acceptable (Howell 2013). Therefore, three of the FGDs conducted had between six and 10 participants, whilst the FGD in Sinbele was limited to five members. The composition of FGDs is displayed in Table 1. The patriarchal and hierarchal structure of Hamer society preordained the male elders' dominance in FGDs. They expressed their thoughts and perspectives on the questions and the rest of the community would mostly agree. This meant that the group dynamics of the FGD were affected, potentially preventing opposing or controversial viewpoints from coming forward. To counter this and following participation by only male elders in FGD1, male elders were deliberately under-sampled and women over-sampled in FGD2–4 to ensure that women's perspectives were also documented; this did appear to facilitate increased group discussion. FGDs were carried out by the main researcher facilitated by a supporting researcher and interpreter. FGDs were conducted in the Hamer villages and in the Hamer language. They were real-time translated so the researcher could probe further discussion. A topic guide was used to facilitate discussion and focused on human and animal health challenges and also subsequent adaptation measures (Additional file 1). Open questions on challenges were used to explore perspectives and allow climate themes to emerge, if at all. All FGDs were recorded on an audio recorder and transcribed after each discussion.

Key informant interviews

Key informant interviews were chosen as a form of primary data collection as they allow the development of depth and context behind beliefs and perceptions (Walliman 2006) and generate an environment for storytelling by evaluating and interrogating personal accounts (Howell 2013). A semi-structured approach was utilised which used a set of pre-conceived topics but allowed for deviation into more open discussion. Eligible participants were males and females aged > 18 years who had broad, practical understandings and experiences of healthcare and diseases of humans or animals and an occupation in a healthcare or non-governmental organisation (NGO) setting. Purposive sampling was used to select key informants from health centres, veterinary clinics and NGOs that served the *kebeles* under study. In total, 11 key informant interviews were completed. All interviews were carried out by the main researcher (SL; foreign national) facilitated by a supporting researcher (ST; Ethiopian national) and an interpreter. Nine of the interviews were conducted in the Hamer language and two were conducted in English. All interviews took place in the key informant's place of work, e.g. health clinic. The Hamer language interviews were real-time translated so the researcher could probe further discussion. A topic guide was used to facilitate discussion, and the focus was different depending on the experiences of the key informant (Additional file 1). For example, the topic guide for health workers focused on the human health needs of the communities and the climate impact on this. Like FGDs, open questions were used in order to explore whether climate challenges would emerge as perceived issues. All interviews were recorded on an audio recorder and transcribed after discussed. Table 2 provides further detail of the characteristics of the interview participants.

Although steps were taken to familiarise the interpreters with the questions and the study topic, translation challenges occurred. Both interpreters were fluent in English and Hamer; however, occasionally, some scientific words, such as some diseases, were lost in translation. This may have reduced the validity of the study as some important phrases may have been lost. In order to overcome this, the vernacular names of diseases were used and participants were asked to describe what they wished to convey.

Table 1 Composition of focus group discussions

Focus group discussion	Location	Number of participants
1	Shanko Kelema	10 (all male)
2	Angude	7 (5 female, 2 male)
3	Kolakeja	6 (5 female, 1 male)
4	Sinbele	5 (3 female, 2 male)

Analysis

A thematic approach was used for data analysis. Audio recordings from FGDs and interviews were transcribed by the research team whilst in the field. This enabled an iterative approach to the research as it allowed the researchers to review how discussions could be further developed (Pope and Mays 1995). The data was inputted into NVivo10 qualitative data software, and Ritchie and Lewis' (2003) framework model was used to analyse data. This involved repeatedly re-reading the transcripts to be familiarised with the data; inductively identifying codes such as particular values, impressions, ideas and phrases; charting similar codes into emerging themes; and promoting an iterative process of interpretation. Emerging themes were then refined to develop key themes and sub-themes (Ritchie and Lewis 2003).

Results

Experience of climate change

During the interviews and focus group discussions, the majority of participants remarked upon changes in climate. The main climate variations voiced were the irregularity of the seasons, a reduction in the amount of rainfall and increasing drought periods. Many participants explained that the seasons had lost their regularity;

Table 2 Characteristics of key informant interviews

Role	Brief description of role	Location (s)	Number of interviews
Health Extension Workers	Basic medical training; provides rudimentary assistance to kebeles such as vaccinations and antenatal support as well as reporting and monitoring disease outbreaks.	Angude Kolakeja Shanko	3
Community Animal Health Workers (CAHWs)[a]	Basic animal health training; gives assistance to the herdsmen and the local veterinarian in carrying out vaccinations and disease monitoring.	Shanko Asile[a]	2
Public Health Officers	Collects and produces data on various government statistics and promotes disease prevention methods.	Turmi Dimeka	2
NGO Workers	Carry out various projects in the woreda ranging from healthcare and water pumps to agricultural training.	Turmi Jinka[b]	2
Veterinarian	In-depth animal health training; provides animal healthcare across the whole woreda	Dimeka	1
Medical Doctor	In charge of a health post, had in-depth medical training and treated patients in the local clinic	Dimeka	1

[a]CAHWs work across all Hamer woreda providing assistance to the mobile herdsmen. One of the CAHWs was located in Asile (a nearby kebele) when interviewed
[b]As the NGO had offices based in Jinka, the administrative centre for South Omo zone, the research team took the opportunity to interview the NGO worker in Jinka

the dry and rainy seasons were becoming unpredictable. They were adamant that this was a recent change. The selected quotes below highlight this:

> You know previously all things happened regularly right. You know the onset of the rainy season, you know when to plough, when to harvest. (Since 2013) things have dramatically changed, the rain become unpredictable, droughts happening. (Female local community member, Angude, FGD02-22.05.19)

> For the past 5 or 6 years the climate has changed, seasons have changed. For example, during the dry season we expect rains happening, in the rainy season we have sun. (Male local community member, Shanko Kelema, FGD01-21.05.19)

In addition to the irregularity of the seasons, the increasing frequency and duration of droughts was highlighted as a concern by many, as emphasised in the quotes below:

> The frequency of drought is now increasing. Before, like 5-10 years ago was okay, now it has changed. (CAHW, Asile, A03-CAHW-25.05.19)

> The biggest challenge is drought. In drought people cannot afford to produce. There is not plenty of grass, no meat, malnutrition and that's also the result of death amongst livestock and this is the biggest challenge. (Male local community member, Shanko Kelema, FGD01-21.05.19)

Lack of rainfall was highlighted as a current challenge by many participants. Insufficient rainfall was stressed as a reason for lack of drinking water for communities as well as the non-existence of suitable proximate grazing lands for livestock:

> There is no water here. They have to go far to get water…. No rain, no water. (Health extension worker, Kolakeja, HW05-HEW-25.05.19)

> The fluctuation of the rainy seasons, it's not common or not normal rainy season. It's not enough rain in the grazing lands. (Veterinarian, Dimeka, A01-V-20.05.19)

Throughout discussions there was a clear concern from the Hamer pastoralists as well as the animal and human health professionals about recent climate variation. Participants were alarmed by the development of unpredictable seasons, insufficient irregular rainfall and increasingly severe prolonged droughts. This variance in climate was perceived as having detrimental effects to crop and rangeland productivity.

Climate influence on livestock health and production

During FGDs, many pastoralists stated that the lack of grazing lands for the livestock to forage, particularly in drought times, was a key issue. Due to the perceived shrinkage of the grazing lands and prolonged drought, many communities explained that a large proportion of livestock were starving and dying. A public health officer in Dimeka outlined the severity of drought and the impact on livestock:

> There was a severe drought (in 2018) that resulted in (the) death of 64,000 livestock, mainly cattle. (Public health officer, Dimeka, HW01-PHO-21.05.19)

The lack of grazing lands in close proximity to the Hamer villages has led to the herdsmen taking the livestock far away to find suitable rangelands. One FGD participant stated that they now need to take their animals more than 70 km away. This was outlined as a problem disproportionally affecting cattle, as they require vast rangelands to graze. On the other hand, goats were labelled as browsers, meaning they would eat many shrubs and could survive close to the Hamer settlements. A FGD participant explains this:

> For goat no problem, goats can eat leaves, you know they can take little bits. But for cow, cow wants big grass and a lot of things. So we go very far with cattle. Goats can stay here and be strong. Stronger than cow. (Female local community member, Sinbele, FGD04-25.05.19)

The sheer distance of the livestock herds from the Hamer settlements due to the limited rangelands created a challenge to access healthcare for the livestock. A CAHW explained:

> (In) the dry season or drought season, their animals, they go far away to find grasslands and then when they travel for long distances they don't get … well treated. (CAHW, Asile, A03-CAHW-25.05.19)

It was also voiced that due to the scarcity of suitable rangeland, numerous livestock herds from differing pastoral groups would be in contact with each other. This led to problems with disease transmission, particularly soil-borne diseases after the rains which is illuminated by a veterinarian below:

> And there are many challenges. They are travelling, crossing the borders. They don't stop. They mix with other livestock and quarantining animals is difficult, so they transfer diseases … But the challenge is after the rainy season because of the occurrence of diseases. The outbreaks are challenging to control due to the types of the diseases... the soil-borne disease, the anthrax, the black-leg. (Veterinarian, Dimeka, A01-V-20.05.19)

To detect outbreaks, the veterinarian and CAHWs outlined that they had surveillance systems in place. However, they expressed that these systems are being stretched outside of Hamer due to the increasing mobility of the livestock herds to find suitable rangelands.

> And … since people move from place to place due to seasonal mobility patterns it's very difficult to trace them right and see and monitor the diseases or outbreaks or so forth. (Veterinarian, Dimeka, A01-V-20.05.19)

Not directly related to livestock health but due to the scarcity of sufficient grazing lands, intra-ethnic and inter-ethnic violence was identified by many as becoming an issue. Encroachment on other communities' territories was leading to clashes and the raiding of neighbouring livestock:

> Pastoralists in Omo valley, they stole the animals from each other. For example, from this village at drought time they take their animals to find water near the Omo river, at this time the neighbours from the other side will come to steal their animals. (Female local community member, Angude, FGD02-22.05.19)

During conversations with animal health workers and the community, it was evident that the main challenge for livestock health was the scarcity of grazing lands. Mass livestock (mainly cattle) deaths from starvation were commonly discussed, and the distance the herds and herdsmen had to travel to find suitable pastures was highlighted. The perception from both the communities and the animal health workers was that these challenges were due to lack of rainfall. The veterinarian expressed concern about soil-borne disease outbreaks especially as most livestock were travelling to similar areas to find pasture.

Climate influence on pastoralist health and nutrition

Findings on the effect of climate on pastoralist health showed that this stemmed directly from the pronounced influence of climate on livestock health. Community reliance on livestock for nutrition, clothes and overall livelihoods was overwhelming. The greatest problem, expressed during FGDs, was food shortages, because livestock could no longer live in close proximity to the Hamer settlements. Communities and health workers explained that this disproportionately affected children and pregnant mothers, as these were the most vulnerable groups in society. Hamer children rely on milk (mainly from cows) for nutrition. Now, due to the remoteness of grazing lands, they are not receiving sufficient milk intake which is leading to the risk of malnourishment:

> … because (of) climate change we do not have enough milk, especially milk for children. Normally in our culture, children (are) always drinking milk, not food. So now (with) the weather changing … they are sick.
> We have to wait for cows because they (are) far

> from us. Someone has to walk for 2 days, 3 days and then he come back here to bring a cow to sell. And then during that time that family (are) getting hungry and children are getting no food.
> (Female local community members, Kolakeja, FGD03-24.05.19)

Insufficient and irregular rainfall was identified as impacting the crop growing season. This summary from a public health officer contextualises the impact of seasonal variability on the health of pastoralists:

> There are changes, very much witnessed changes in weather. The onset of rain has changed, productivity like from ploughing time, sun time, harvesting time has all changed. And people are not prepared for all these sudden changes … and so when a drought happens, they will easily be affected. This results in less production or no production which results in less food, malnutrition and immunity decreases and that exposes them to challenges. (Public health officer, Dimeka, HW01-PHO-21.05.19)

A lack of nutrition and subsequent malnutrition were highlighted by health workers as decreasing the immunity of children making them more susceptible to other diseases. A medical doctor gives his perspective in the quote below:

> malnutrition has an effect on the immunity of the children. When the immunity lowers they will be exposed to so many other diseases like infections. So that is the challenge in this area. (Medical doctor, Dimeka, HW06-D-28.05.19)

The lack of rainfall and prolonged drought periods created a generalised water shortage which NGO and health workers saw as posing a major health challenge with poor hygiene and sanitation. Insufficient water sources meant that clean drinking water was scarce, forcing people to collect water from unclean sources. The quotes below are from an NGO worker whose projects aim to provide clean water to Hamer communities. He explains the current challenges in sourcing water in Hamer (1) and the health challenges that have subsequently developed (2):

> (1) It's warm in Hamer *woreda* and because of that the rains don't come timely. (There) is not effective harvesting (of) water from (rain) catchment. The second choice was ground water. Due to the nature of the area ground waters are scarce.
>
> (2) Due to (lack of water) the communities are using the water which is in the sand … from the Keske (river). They are digging (in) the sand … but that water is really not protected so diarrhoeal disease is common.
>
> (NGO worker, Jinka, NGO02-29.05.19)

In addition to the health challenges of malnutrition and water scarcity, multiple health workers highlighted challenges with changing disease patterns, though these perceptions were not expressed by the communities themselves. Below are two quotes highlighting the observations by health workers:

> An additional schedule for malaria infestation, even when you have drought … Right after you receive rains, and after a week or so malaria spreads. So these are not like known schedules for malaria to happen. (Public health officer, Dimeka, HW01-PHO-21.05.19)

> Global warming has increased and the trend of the diseases has changed. They are changing (in the) tropics. (Medical doctor, Dimeka, HW06-D-28.05.19)

The influence of climate change on the health of pastoralists was perceived by communities as being indirect. The reliance on livestock for sustaining life meant that any issues with livestock health or production would yield secondary effects on the human population. Malnutrition of vulnerable groups was visible and was emphasised by communities and health workers alike as being a consequence of insufficient milk due to a lack of nearby livestock. Water scarcity, resulting from lack of rainfall, contributed to increasing diarrhoeal disease as communities were forced to use unclean water sources for drinking and hygiene. Lastly, health workers expressed concern at changing disease patterns, especially for malaria.

Lack of access, awareness and knowledge

Throughout all the interviews and FGDs, there emerged overarching themes of poverty, lack of access to services, lack of knowledge and lack of awareness of the pastoral community. These issues were reflected across the whole of the Hamer *woreda*. Poverty was emphasised as a long-standing and all-encompassing issue by most participants. Communities voiced that a lack of a disposable income presented various challenges which increased their overall vulnerability to natural and man-made shocks. The lack of access to services, particularly health services, was highlighted as a challenge by almost every participant. These issues are captured in the highlighted quote:

> Here the *kebeles* are far away from each other, and here in our health centre, people come from a distance of 40km or 50km … .. barefoot. There are health posts and health extension workers, but they are not much qualified to diagnose them and treat them and they don't have any investigations... We don't have cars or ambulance to bring patients around to the health centre, so this is the challenge we are facing always. (Medical doctor, Dimeka, HW06-D-28.05.19)

The lack of knowledge and awareness of health issues amongst the pastoral communities was emphasised by health workers and communities alike. Many communities explained how they lacked information and education to prevent certain illnesses. Several health workers illuminated the difficulties encountered when many Hamer presented late to facilities due to lack of awareness or would not seek out health services at all:

> Our community, we don't have knowledge, so we don't know which one is making us sick, which one is good for us, we don't know. We can eat food, like yesterday's food we don't make hot … after we get sick. (Male local community member, Sinbele, FGD04-25.05.19)

> In this area they (Hamer pastoralists) wouldn't come to you and they do not even have a belief in modern medicine. (Medical doctor, Dimeka, HW06-D-28.05.19)

The absence or delay in seeking healthcare was also attributed to traditional healing beliefs and practices. This was mainly highlighted as an issue by healthcare workers whereas Hamer communities saw it as a necessary step in controlling disease. The view of the pastoral communities is outlined in the quote below:

> Firstly, the elders come together, and they ask Barjo (God) to stop the children (to) get sick … so we just make cultural things to make the disease stop. It our own culture. (Male local community member, Sinbele, FGD04-25.05.19)

> Before they come to the facility, they practice first traditional medicine, then if (they have) not begun to heal, they come to our health centre. First of all, they test traditional medicine, all of the peoples. (Public health officer, Turmi, HW04-PHO-23.05.19)

After speaking to the communities and health professionals, it was evident that underlying socio-economic and cultural factors presented significant health challenges. The lack of quality infrastructure and services accessible to the sparse communities was apparent. Many individuals understood that they had a limited or inadequate knowledge on health issues but expressed that they lacked the educational opportunities to learn.

Coping mechanisms and adaptations

When asked about adapting to the current challenges facing their communities, the pastoralists were very open to change and diversification of their livelihoods. There was understanding amongst the communities and CAHWs that camels would be beneficial in drought periods and so many communities expressed an interest. However, information about camels was new and no community in the FGDs currently had any. Below are two quotes highlighting the interest in camels. The first (1) is an FGD participant speaking about an experience in the Afar region of northeast Ethiopia and the second (2) is from a CAHW illuminating the rationale behind purchasing camels:

(1) I managed to get a good experience from the other side of Ethiopia. I saw the people who live there are the same, pastoralists, and they faced similar problems like drought and have lost their animals like this. And they start like producing camels, because camels they stay more than 2 months without water. (Female local community member, Angude, FGD02-22.05.19)
(2) All over the Hamer lands there is no enough grass or leaves for the animals. Now we change our animals into money, and we buy camels because camels eat any type of leaves. (CAHW, Asile, A03-CAHW-25.05.19)

This was reiterated by a veterinarian who stated that camels were being introduced into herds by NGOs and the government with the benefactor paying a subsidised fee. According to the veterinarian, a total of 84 camels have been introduced into the area recently. However, there was also concern with the challenges that the introduction of a new livestock species brings to the community:

> Since a camel is a new animal to the environment and their knowledge, they don't know what toxic plants will kill them or not. Some of them are dying because they don't know the management and don't know which specific plants they eat, and which are toxic. (Veterinarian, Dimeka, A01-V-20.05.19)

The veterinarian added that they too are not specialists in camel health, nor are CAHWs.

An adaptation strategy suggested multiple times by the pastoral communities was to sell livestock in the market and use that money to purchase a mode of transport such as a motorbike. This could then be used for business purposes and also as transport to services:

> Some people want to sell goat and then buy motorbike and have business. So many people are changing work because animals are dying now in the dry. (Female local community member, Kolakeja, FGD03-24.05.19)

One community member gained a practical insight into the coping mechanisms of a similar pastoral group in the Afar region. They learnt that when there is prolonged drought the Afar pastoralists would sell some of their animals acquiring a disposable income. Then they would use this to repurchase some livestock when the rainy seasons come.

NGO workers suggested that the most practical solution for the pastoral community would be to move to a permanent settlement. If the Hamer became less mobile and transitioned to more sedentary agricultural practices, it would be more beneficial to both health providers and the community. One NGO worker outlined how the mobility of the Hamer pastoralists currently makes it a considerable challenge to provide health assistance:

> to make health services deliverable and accessible to all communities, they need a permanent settlement condition. They (the Ethiopian Government) will provide health service for their day-to-day health problems. But one of the challenges to access them is their mobility. (NGO worker, Jinka, NGO02-29.05.19)

The need for diversification of livelihood strategies was apparent amongst the Hamer communities. Selling their existing livestock for camels, motorbikes or just simply for cash was voiced as viable options by pastoralists. From the NGO workers' perspective, permanent settlement would be the easiest way to access these communities and provide suitable healthcare and services. Through observation of the communities, it was apparent that many Hamer were indeed leaving the traditional lifestyle and settling in towns such as Turmi.

Discussion

The aim of this study was to explore the perspectives of Hamer pastoralists on the influence of climate change on their health and the health of their livestock. Findings from this research reveal that the recent perceived climate variability has had a profound impact on the livelihoods and subsequently the health of the Hamer community and their livestock. The impoverished region lacks significant infrastructure and basic services. Whilst many communities rely on traditional health practices, modern medical facilities and healthcare face an ever-growing demand. The dispersion of cattle, the major livestock type upon which livelihoods depend, far away from settlements has had a significant impact on the nutritional status of vulnerable societal members, particularly children. The Hamer are used to having to adapt and diversify. In fact, it was evident that communities have been slowly shifting to a degree of urban sedentarisation.

Experiences of climate change

Hamer pastoralists were very aware of recent changes in climate. Whilst they may lack understanding of the scientific details of climate change, communities voiced their experience of changes in weather over time and recalled significant climate events. Their experience of the growing irregularity of seasons, inadequate erratic precipitation and an increase in drought periods largely fits with climate predictions for the region as well as similar studies in Ethiopia more generally (Tefera and Kaneko 2020; Debela et al. 2015; Megersa et al. 2014). Country-wide climate averages are difficult to use in local contexts due to the topographic variety across Ethiopia; there is high spatial and temporal variability of rainfall (Abebe 2010). Across the country there has been a slight decrease in annual rainfall from 1951 to 2010 (Federal Democratic Republic of Ethiopia 2019). However, across southern Ethiopia, the February to May rains (*Belg*) declined by 15–20% between the mid-1970s and late-2000s (Funk et al. 2012). These are the main crop growing rains, and if the trend continues, it will further seriously impact food security in the region.

The community observations of increasing frequency and magnitude of droughts is consistent with similar studies across Ethiopian pastoral communities (Megersa et al. 2014; Abebe et al. 2012; Samson et al. 2011). The more frequent droughts are producing repeated shocks which accelerate the cycle of poverty and increase the communities' vulnerability. The extent to which we can attribute droughts to anthropogenic climate change is still being discussed (Philip et al. 2018). Temperature and precipitation are affected by oceanic climate interactions, such as El Nino, which can increase the severity of climate events. However, anthropogenic warming has substantially contributed to increasing sea surface temperatures which can reduce rainfall across Ethiopia and precipitate drought (Funk et al. 2016; Funk et al. 2015). The projected increases in the variability of rainfall and increasing temperatures will likely lead to increases in

the occurrence of droughts in the future (Federal Democratic Republic of Ethiopia 2019; Keller 2009).

Impact on livestock health and production

Cattle pastoralism suffers greatly from exposure to unpredictable droughts generating substantial asset losses and lengthy recovery periods (Megersa et al. 2014; Angassa and Oba 2007). The Hamer lost "64,000 livestock" as a result of severe drought in 2018 which demonstrates the magnitude of the direct impact of adverse climate events (Public Health Officer, Dimeka, HW01-PHO-21.05.2019). Recovery after droughts is often challenging and slow, especially for communities so reliant on livestock (Angassa and Oba 2007). As starvation and dehydration are the leading causes of death amongst livestock during drought, responses should focus on providing supplementary feed and water (Catley et al. 2014). It was highlighted by animal health workers that the post-drought rains led to an increase in disease outbreaks. This research supports the view that animal health workers need to provide veterinary care as soon as droughts end (Catley et al. 2014).

The shrinkage and degradation of grazing lands voiced by communities and animal health workers alike is a key challenge for the Hamer pastoralists. Studies with similar pastoral groups in Ethiopia also found this (Megersa et al. 2014; Teshome et al. 2010). The expansion of grazing beyond cultural territories is not necessarily only due to resource scarcity (Tefera 2013), although that is usually the primary reason (Worku and Lisanework 2016; Teshome et al. 2010). The Hamer are targeting improved quality pastures and easier water access to maximise livestock production. Livestock are a sign of high social standing and prestige as well as the main source of food. This has created an increased demand for quality land on which they can graze (Tefera 2013). Furthermore, population growth and overcrowding has put additional strain on grazing lands (Enyew and Hutjis 2015). Erratic and insufficient rainfall, combined with prolonged drought periods, is expected to further exacerbate the shortage in quality pastures (Tefera 2014). Should the Hamer go further into northern Kenya, South Sudan or other parts of Ethiopia to seek suitable lands, then they will be risking further conflict with other pastoral groups. This may lead to cross-border disputes and violence, but they may be left with no other option.

Animal health workers reported that increased competition for rangelands was also increasing the risk of disease transmission. A shortage of grass and water resources meant that multiple herds of livestock would congregate in the same areas, increasing disease transmission amongst contact networks, a finding also reported by VanderWaal et al. (2017). During post-drought rains, soil-borne diseases such as anthrax emerge rapidly in herds and have devastating impacts on livestock health and mortality (OIE 2019). Limited surveillance with few and distant animal health workers makes control of disease outbreaks challenging.

Impact on human health and livelihoods

Hamer reliance on livestock for nutrition means any situation reducing livestock access and production will adversely impact their health. In recent years, the Hamer have transitioned to some agro-pastoralist practices making communities heavily dependent on a good crop growing season for food security. The population relies on successful seasonal rainfall both for the growth of crops and the regeneration of rangeland. The research revealed that many communities complained of insufficient rainfall and a declining crop yield. Data from Famine Early Warning Systems Network (FEWS NET) supports the observations made in this study by Hamer communities surrounding reducing rainfall. The data suggests that the 2019 February to May rains (*Belg*) were late and were characterised by long dry periods and below average rainfall (FEWS NET 2019a). Communities and health workers stated that this put many Hamer communities at risk of food insecurity. FEWS NET mapped acute food insecurity in June 2019 across Ethiopia; Hamer *woreda* was depicted as being in crisis phase along with the majority of South Omo and southern Ethiopia (FEWS NET 2019a). Crisis phase is described as "high or above usual acute malnutrition or marginally able to meet minimum food needs but only by depleting essential livelihood assets or through crisis-coping strategies" (FEWS NET 2019b). Whilst there is a lack of data on admissions to feeding programmes in Hamer *woreda*, a health extension worker explained how "many, many children come to the clinic to get plumpynut (ready-to-use therapeutic food)" (Health extension worker, Kolakeja, HW05-HEW-25.05.19). In addition, approximately 82,500 kg of supplementary food was provided by the Red Cross to the Hamer *woreda* in 2018 due to substantial food insecurity from severe drought (Ethiopian Red Cross Society 2018).

Reasons for undernutrition are plentiful and include lack of knowledge, poor hygiene and chronic disease; however, food insecurity is a significant factor (Wayua 2017). The Hamer, like most pastoral groups, heavily rely on milk (usually cow's milk) for nutrition due to its efficiency as an energy source. Milk can be available daily; this contrasts with meat which is usually only available periodically (Chotard et al. 2010). Milk contains high-quality protein, fat, vitamins and minerals which are particularly important for the growth of children (Chotard et al. 2010). Shortages in milk thus make infants and children the most vulnerable group for

undernutrition. The adverse impact of climate change on livestock and associated husbandry practices is precipitating nutritional deficits in communities. The lack of adequate grazing lands means only a minority of cows reside near Hamer settlements, resulting in insufficient milk for the children. If the climate trends are to continue as predicted, then food insecurity may become more widespread across the Hamer *woreda*. This is going to put even more stress on an already strained health system with very limited resources. More children are likely to be reliant on food aid and cases of severe acute malnutrition will be expected to increase.

Health workers in Hamer explained how malnutrition or undernutrition puts individuals, especially children, at risk of concurrent illnesses (Bourke et al. 2016). Malaria and diarrhoea were highlighted as a common disease acquired by undernourished children. Whilst the association between malnutrition and diarrhoea is well-studied there is debate surrounding the link between malnourishment and malaria (Das et al. 2018; Bilal et al. 2016; Fillol et al. 2009).

Changing disease patterns resulting from variations in the climate were also identified by health workers. Many studies have suggested that vector-borne disease such as malaria will be exacerbated by climate change, increasing the parasite's geographical range and transmission period (Simane et al. 2016; Samson et al. 2011). Whilst communities did not mention an increase in malaria, health workers identified irregular additional malaria seasons, mostly during post-drought short rains. This is putting further stress on health services as the remoteness of many communities means accessing healthcare facilities is difficult; many cases are advanced by the time they reach medical help. Malaria transmission is multifactorial and influenced by community awareness and insecticide-treated net use (Debo and Kassa 2016). Community members expressed the need for good quality nets, yet public health officers described a shortage of nets in the area. Effective preventative procedures could greatly benefit the communities. In addition to malaria, the medical doctor in Dimeka acknowledged a trend of increasing topical diseases. This is also in keeping with observations from other studies in Ethiopia (Simane et al. 2016; Teshome et al. 2013). Although climate is perceived to have influenced health in Hamer, the lack of access to health services, insufficient resources and limited awareness of communities significantly amplify the health challenges the climate creates.

Lack of access, awareness and knowledge

It is crucial to acknowledge the socio-economic challenges the Hamer communities face when looking after their own health and that of their livestock. Pastoralist societies are amongst the poorest in Ethiopia and frequently rely on humanitarian assistance to survive (Mengistu 2016; Markakis 2004). Hamer communities spoke about the economic problems they face; their wealth is contained in their livestock, limiting their physical cash. This results in delaying access to services, such as healthcare facilities, as it takes time to sell animals to acquire money. Whilst the Hamer identified expansion of their livelihood strategies in order to increase tangible cash, the lack of financial services available to pastoralists hinders this.

The vulnerability of the Hamer pastoralists is amplified by their isolation and mobility patterns. Communities' lack of access to healthcare and other basic services combined with a self-proclaimed lack of knowledge and awareness result in augmented health and livelihood challenges. Livestock mobility is fundamental to Hamer pastoralist livelihood strategies (Tefera 2013), but presents further challenges to accessing healthcare for both herders and their animals. Current health systems are not designed for mobile populations (Montavon et al. 2013). The introduction of mobile health extension workers and CAHWs was seen to be beneficial by communities in this study, especially their vaccination programmes. Similarly, mobile health teams funded by UNICEF were found to be greatly valuable to other pastoral groups in Ethiopia (Indrias 2012). However, other studies have noted the high running and maintenance costs of mobile health clinics compared to permanent ones as a major drawback (Zinsstag et al. 2006; Duba et al. 2001). Limited awareness and knowledge of the Hamer communities further intensifies the health challenges, especially when exacerbated by the use of traditional healing practices and beliefs. Many communities stressed the need for education on disease prevention methods. The government or NGOs should look to implement health education strategies in Hamer in order to improve health seeking practices.

Conflict

Rangeland insecurity is likely to further fuel longstanding cultural divides and tensions (Teshome et al. 2010). With such wide ethnic diversity in South Omo, encroachment into other cultural territories is dangerous. The risks herdsmen are taking when accessing suitable rangelands highlight the significance and magnitude of the challenges they face. Conflict between pastoral groups in South Omo has been well-recorded and the causes are multifactorial, including societal reputation and retaliation (Debebe 2016; Wood 1993). The potential for conflict to arise in South Omo is only going to increase with the shrinkage of rangeland and resources (Blackwell 2010). Cross-border conflict could also progress if Hamer herdsmen are taking their cattle further distances into "South Sudan or northern Kenya"

(Veterinarian, Dimeka, A01-V-20.05.19). The potential consequences of intensified ethnic conflicts are extreme. The Dassenech, a neighbouring pastoral group, lost 24, 000 livestock in conflicts with the Turkana (Kenya) during 2000 (Michael et al. 2005). Furthermore, Hamer raids on the Dassenech between September 2009 and July 2010, resulted in the killing of eight people and an unknown number of livestock were stolen (Yntiso 2012). It is evident that conflict is common amongst the many ethnic groups as they have historically fought for cultural and territorial reasons (Debebe 2016; Michael et al. 2005; Wood 1993). The competition for resources is likely to fuel further violence and may result in further deaths and displacement of vulnerable populations.

Coping mechanisms and adaptations

Diversification and adaptation strategies were of great interest to the Hamer communities. It was apparent that they were constantly learning and altering their husbandry and agricultural methods to sustainably exploit resources. The Hamer have transitioned into a more agro-pastoralist society who, although still heavily rely on livestock, practise agrarian activities nearby to their settlements (Tefera 2013). This is similar to other pastoral groups across the region (Enyew and Hutjis 2015; Yohannes and Mebratu 2009). It is proposed that diversification and adaptation can strengthen resilience and reduce vulnerability to both man-made and climate shocks. However, it may have the opposite effect if it undermines the primary livelihood strategy (Beyene 2012; Davies and Bennett 2007). Motives for diversification are varied and many are not climate-related, such as increases in human population (Enyew and Hutjis 2015; McCabe 2003) and disease outbreaks in livestock (Little et al. 2001). However, in the case of the Hamer, the decrease in livestock production due to degradation of the grazing lands and drought was fuelling livelihood diversification. Some of the adaptation methods mentioned by Hamer communities have been noted in other pastoral groups in Ethiopia including purchasing vehicles for transport (Tefera and Kaneko 2020; Yohannes and Mebratu 2009), selling livestock at market (Davies and Bennett 2007) and changing livestock composition (Mekuyie et al. 2018). However, the results of observing the Hamer in this study show only a minority of communities had actually accomplished major livelihood diversification.

The Ethiopian Government's persistent rhetoric has been one that portrays pastoralism as an unviable livelihood strategy (Anbessa 2015; MoFED 2006). The most recent Growth and Transformation Plan produced by the Ethiopian Government encourages pastoralists to lead a "sedentary life" (National Planning Comission 2016). This was also the opinion of the NGO workers interviewed and is often the view of many development agencies working with pastoralists. Many NGOs have however shifted their attitude to pastoral development towards a more community-enabling approach (Pavanello 2009; WISP 2008). Whilst settlement is argued to increase educational, healthcare and economic opportunities (Eneyew 2012; MoFED 2006), some studies show that in fact settling pastoralists leads to the worsening of health (Fratkin et al. 2004). In addition, settling would lead to an increased reliance on the state and the cash economy (Fratkin and Roth 2005). Instead, it is acknowledged that a facilitative approach from development agencies and governments, assisting the Hamer with their innovative diversification methods, would greatly benefit the communities (FAO 2016; Pavanello 2009). This could be assisting with livestock market efficiency and access (Shibru 2017; Pavanello 2009), building on local customary institutions (Pavanello 2009; WISP 2008) or encouragement of pastoralist representation in national politics (Markakis 2004).

Conclusion

This study has explored the perceptions of the Hamer pastoralists regarding the influence of climate change on their health and that of their livestock. The community awareness and experience of recent variations in climate is alarming. The loss of seasonality, erratic rainfall and prolonged droughts are perceived to be having adverse consequences on their health, livestock and fundamentally their livelihoods. The decreasing livestock production due to diminishing rangelands and drought has had a detrimental impact on the nutritional status of many vulnerable members of Hamer society. Undernutrition is adversely affecting the immunity of children, putting them at increased risk of concurrent infections. Further, out-of-season outbreaks of climate-sensitive diseases such as malaria are threatening an already poorly resourced healthcare system. The lack of health infrastructure and resources in the Hamer *woreda* perhaps reflects a marginalisation of pastoral groups, stemming from the government's historical rhetoric categorising pastoralism as an unviable and impracticable livelihood system. The Hamer have been diversifying their livelihood strategies to cope with a wealth of pressures, including climate variations. This includes altering livestock composition, selling livestock at market and purchasing alternative income methods such as transport vehicles. Given the range of negative impacts that climate change is already having on the health of Hamer pastoralists, their livestock and ultimately their livelihoods, the implications of climate change must be considered to ensure the sustainability of pastoralist communities. Transition away from pure pastoralism has already begun, and it is likely that climate pressures

will shift pastoral communities further from their traditional livelihoods. However, it is vital that the government and NGOs do not overlook the ability of pastoralists to sustainably develop on their own and perhaps their role is to simply facilitate these transitions.

Abbreviations

BBC: British Broadcasting Corporation; CAHW: Community Animal Health Worker; CO_2: Carbon dioxide; FAO: Food and Agriculture Organization; FEWS NET: Famine Early Warning Systems Network; FGD: Focus group discussion; GDP: Gross Domestic Product; IPCC: Intergovernmental Panel on Climate Change; MoFED: Ministry of Finance and Economic Development; NGO: Non-governmental organisation; OCHA: United Nations Office for the Coordination of Humanitarian Affairs; ODI: Overseas Development Institute; OIE: World Organisation for Animal Health; SNNP: Southern Nations, Nationalities and Peoples; UNEP: United Nations Environment Programme; UNICEF: United Nations Children's Fund; WISP: World Initiative for Sustainable Pastoralism

Supplementary Information

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Additional file 1. Topic guides used in FGDs and KII

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Manuscript publication

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Authors' contributions

SL, SM, ST and BM contributed to the study design. SL and ST conducted the focus groups and key informant interviews. SL analysed the data and wrote the first draft of the manuscript. All authors contributed to revised drafts. The author(s) read and approved the final manuscript.

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Availability of data and materials

Transcripts of the interviews analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

Ethical clearance for this research was obtained from the MSc Ethics Review Panel at Liverpool School of Tropical Medicine, UK (Ethics Application 1918), and the Institutional Research Ethics Committee at the International Livestock Research Institute, Addis Ababa, Ethiopia (ILRI-IREC2019-09).

Consent for publication

All participants were either given a participation information sheet to read or the information was read aloud before the discussions began. It was made clear that participation in the study was voluntary and that withdrawal from the study was acceptable at any point. Written consent was obtained from all literate participants, and in the cases where the participants were illiterate, verbal consent was acquired.

Efforts to uphold participant confidentiality were made across the duration of the research process. Both the researchers and interpreters signed a confidentiality agreement before the beginning of data collection. Due to the group nature of focus groups, confidentiality could not be guaranteed. However, the researchers made the participants aware of the importance of maintaining confidentiality.

Only the researchers had access to the data which was stored on a password-protected computer. The recordings on the voice recorder were deleted shortly after the files had been saved onto the computer. All quotations in subsequent writing were anonymised.

Competing interests

The authors declare that they have no competing interests.

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