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Source: Mountain Research and Development, 30(4):381-390.
Published By: International Mountain Society
https://doi.org/10.1659/MRD-JOURNAL-D-09-00072.1
URL: http://www.bioone.org/doi/full/10.1659/MRD-JOURNAL-D-09-00072.1

Mountain Research and Development (MRD)
An international, peer-reviewed open access journal
published by the International Mountain Society (IMS)
www.mrd-journal.org

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Farmers' Perceptions of Livestock, Agriculture, and Natural Resources in the Rural Ethiopian Highlands

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Increasing human and livestock populations in Ethiopia are leading to a growing demand for food and feed. Cereal cropping is highly prioritized at the cost of the livestock subsector and the environment. Grazing land is decreasing, leading to overstocking and overgrazing of pastures, thus fueling conflicts over scarce resources and exacerbating further land degradation. Two independent surveys were carried out in 4 areas in the Ethiopian Highlands, using questionnaires to investigate livestock husbandry as well as farmers' perceptions and attitudes regarding the relationship among cropping, livestock, and natural resources, in the context of broader reflection on what could help support Ethiopia's human, animal, and environmental needs in a sustainable way. In total, 684 farmers were interviewed in 75 villages. The majority of animals were said to be fed on natural pasture and crop residues; only 1.3% of the respondents purchased supplementary feed. Overall, cropland had increased in the study area at the cost of grazing land, and overstocking of pastures was seen as a major problem. Decreasing grazing land was also considered to be due to drought in Woldia and increased human population in Gurage. No pasture management system was in place at community level in our study sites. Less than 2% of the respondents perceived and understood land degradation and subsequent reduced land fertility to be a constraint for sustainable feed production. Measures and priorities for future livelihoods were perceived differently by farmers from different regions. We discuss strategies for de-stocking cattle herds, the nature of which is intrinsically tied to cereal cropping. This study highlights the lack of understanding amongst farmers of the causes and effects of land degradation and the lack of community-based strategies for conservation agriculture.

Keywords: *Ethiopia; agriculture; livestock; land use; conflict; natural resources.*

Peer-reviewed: *March 2010* ***Accepted:*** *May 2010*

Introduction

Ethiopia, well known for its recurrent famines, is amongst the poorest countries in the world and receives the most voluminous food aid in the world (Berry 2003). Agriculture remains the major economic sector in the country, accounting for 43.8% of the national gross domestic product (GDP), 90% of exports, and 85% of employment (CIA 2009). Over 90% of agriculture—characterized by smallholder mixed farming (crop and livestock)—is practiced in the Ethiopian Highlands, which accounts for only 40% of the total territory but carries more than 80% of the human and 70% of the livestock population, making this the most densely inhabited part of the country (Demeke 2006). The Ethiopian Highlands are jeopardized by severe land degradation (Gete and Hurni 2001; Tadesse 2001; Daba et al 2003; Nyssen et al 2004, 2008; Hurni et al 2005). This has direct impacts on agricultural productivity, affecting both cultivated and pastureland through loss of soil and decreased soil fertility, thus constituting a major hazard to sustainable agriculture and feed resources (Hurni 1990; Yirdaw 1996; Nyssen et al 2009). The loss of agricultural value for the period 2000–2010 has been estimated at US$ 7 billion (Sonneveld and Keyzer 2003).

With an Ethiopian population of over 85 million people growing at 3.2% per year (CIA 2009), pressure on the agricultural sector is constantly increasing. Landholdings in the Ethiopian Highlands have an average cropland of 1.2 ha per household (CSA 2007b), but this is predicted to fall to 0.6 ha per household by 2015 due to population growth (Teketay 2001). Despite an overall increase of cropland (at the cost of grazing land) and cereal production, food availability per capita has decreased in the last decade (Sonneveld and Keyzer 2003; CSA 2007b).

In order to secure food availability and alleviate poverty, the Ethiopian government defined cereal intensification as a priority a decade ago (Byerlee et al 2007). By comparison, the livestock subsector remains

FIGURE 1 Field plowing in the Ethiopian Highlands (Woldia Woreda) using oxen pulling a traditional plow, the *maresha*. (Photo by Rea Tschopp)

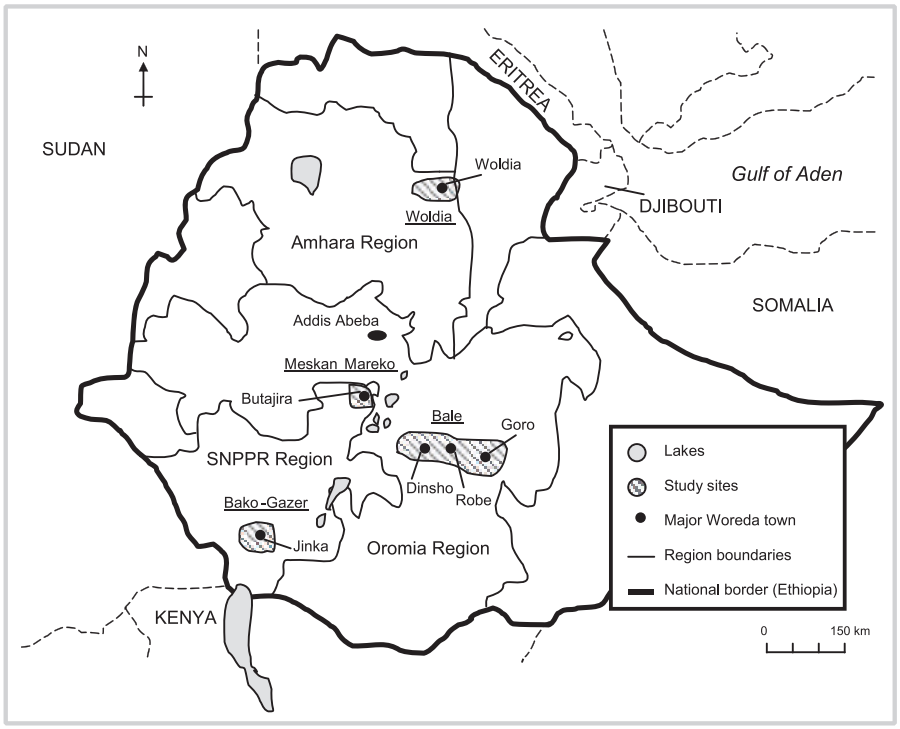
marginalized, with little effort to improve animal productivity and animal health and promote better management of pastures and thus animal feed. Thus, this subsector does not contribute its full potential to the national economy (Gebremedhin et al 2004; Ibrahim 2004). Ethiopia has the largest livestock population in Africa, with a cattle population of 43 million head (CSA 2007). Animals are kept for milk, meat, draught power, manure, and economic security. Importantly, livestock keeping is intimately linked to agriculture. Traditional farming practices in the Ethiopian Highlands depend on draught oxen for plowing and threshing (Figure 1) (Goe 1987; Gebregziabher et al 2006). Draught power has been shown to be related to poverty because farmers owning fewer oxen cultivate smaller areas and produce less labor-intensive but cheaper pulses instead of cereals (Astatke and Saleem 1996). The increasing livestock population is forced to graze on a decreasing amount of grazing land, which contributes to further land degradation (Gebremedhin et al 2004), poorly nourished animals characterized by low productivity, and conflicts over natural grazing land (CSA 2001, 2007a, 2007b; Nyssen et al 2009).

Numerous quantitative studies have been done on land-use management, but studies that take account of knowledge about farmers' perceptions of their livelihoods and of land-use management have been rare to date. Qualitative research methodology is ideal to investigate perceptions and provides a greater depth of information on the relevance of the subject from the perspective of a target audience in a context-specific setting (Dahlgren et al 2004). Studies using this methodology strengthen and complement previous quantitative studies, which have a high level of measurement precision and statistical power. Using questionnaire surveys, the present study explored prevailing husbandry practices in 4 study areas in the Ethiopian Highlands. It also recorded farmers' perceptions of the current delicate balance among livestock, cropping, and natural resources, and asked them to outline their livelihood objectives.

Material and methods

We conducted 2 independent farmer household surveys using questionnaires with closed and open questions as part of a larger project assessing bovine tuberculosis in rural Ethiopia. Farmers were randomly selected within the multistage sampling framework of the tuberculosis project, according to their willingness to participate and

FIGURE 2 Map of Ethiopia showing the different study sites. (Map by Rea Tschopp)



only after they had given their oral consent. All questionnaires were translated into Amharic and back-translated into English for validation of misunderstandings and mistranslations. Interviews were carried out by a trained enumerator. The main researcher was also present during all interviews to verify the accuracy of questionnaire filling. Only farmers who were fluent in Amharic (speaking and understanding) could participate in the interviewing process. We relied entirely on farmers' information (qualitative research), since the purpose of the study was to describe the situation through the farmers' eyes. The reliability and validity of the information were cross-checked through regular visits to farms during bovine tuberculosis testing of animals over 3 consecutive years, and through discussions with village leaders, village elders, and extension workers (in-depth discussions and/or focus group discussions; data not presented in this article).

The first survey was conducted between 2006 and 2007 in 4 Woredas (districts) of 3 regions: (1) Meskanena Mareko (referred to hereafter as Meskan), a Gurage area in the Rift Valley (Southern Nations, Nationalities and People Region, SNNPR) located at 8°10′N and 38°20′E (1800–2170 m), (2) Woldia (Amhara region) located at 11°55′N and 39°35′E (1460–3490 m), (3) Bako Gazer (SNNPR) located at 5°45′N and 36°40′E (1338–1634 m), and (4) the Bale Mountains (Oromia region), a larger geographical area located between 6°50′N and 7°10′N and between 39°40′E and 40°20′E (2120–3500 m). In the latter zone, we regrouped 3 neighboring sites, Woredas, Dinsho, Robe and Goro, into 1 study site (Figure 2). The study sites covered 2 typical agro-ecological zones in the Ethiopian Highlands: *woina dega* between 1500–2300 m and *dega* above 2300 m. The questionnaires for this first survey included general questions on farm size, livestock husbandry (grazing system, fodder, farm input, keeping of other livestock), herd structure and herd turnover (exit due to death/sale and entry due to birth/purchase/gift), use of manure, and off-farm jobs.

The second survey was conducted between 2007 and 2008 in only 2 of the Woredas, the eastern part of Woldia (between 1400 and 2000 m) and Meskan (1800–2170 m). This questionnaire focused on questions related to land use, livestock, and interaction between livestock and natural resources, and changes over time as perceived by farmers. Farmers were also asked about occurrences of conflicts over natural resources and their objectives regarding livestock and land availability for the future.

Although the interviewed farmers in both surveys were from various ethnic, religious, and cultural backgrounds, they were all traditional livestock smallholders in the Ethiopian Highlands, involved in both cropping and livestock husbandry with similar farm management.

Additional demographic data at region and zone level were collected from the Central Statistical Agency (CSA), Addis Ababa, and the Ministry of Agriculture and Rural Development, Addis Ababa. All data were double entered in Access and validated for entry errors with the statistical

TABLE 1 Overall herd structure of the interviewed farms.

Cattle categories	Number	Percent of total number
Calves (<1 year)	546	14.0
Juveniles (1–3 years)	730	18.7
Breeding cows	1183	30.4
Breeding bulls	581	14.9
Oxen	850	22.0
Total cattle	3890	100

software package Epi Info (version 3.3.2). Analysis was done using the statistical software package STATA 9.1 (StataCorp, Texas, USA) and Microsoft Excel® 2002.

The study received ethical approval from the institutional AHRI/ALERT (AAERC) and the national (NERC) ethical review committees.

Results

Livestock-keeping survey

In total, 536 farmers were interviewed in 4 Woredas, which included 24 Kebeles (smallest administrative unit) and 75 villages. According to their replies, 58% percent of farmers grazed their animals on communal land, whereas the other animals grazed on farmers' own land. Animal feed mainly consisted of forage from natural pastures (free and uncontrolled grazing) and crop residues after harvest, with purchased feed such as oil-cakes and molasses accounting only for 1.3% of the total feed. Veterinary services varied, with farmers stating that 56% of their cattle were regularly vaccinated and only 33% regularly dewormed. Seventy percent of farmers also mentioned that they kept other livestock in addition to cattle.

Cattle herd structure is shown in Table 1. Adult uncastrated and castrated males (37%) exceeded the number of breeding cows kept by interviewees (30%). Nearly a quarter of the herds consisted of oxen (22%). Regardless of age, total males accounted for 52% of herds. With regard to breeding animals, there were only twice as many cows (30%) as bulls (15%), thus 1 bull for 2 cows.

Regarding herd turnover, 38% of farmers mentioned having purchased at least 1 animal during the previous year, which was more or less equal to the number of farmers (36%) having sold at least 1 animal in the same period. Births were recorded twice as often as deaths, with 63% of farms having had at least 1 calving during the previous year and only 29% of farms recording at least 1 death.

Eighty percent of farmers mentioned holding oxen as draught animals, accounting for 98% of all oxen (Table 2). The remaining 2% of oxen were used for fattening. Twenty-three percent of all breeding males were also used for draught power. Females were rarely used as draught animals (0.4%), and 79% of all draught animals were said to work more than 6 months per year.

Seventy-four percent of respondents valorized manure: 21% used it as fertilizer, but the majority (79%) used it as a source of fuel in the household and sold the remaining unused manure. Overall, 38% of respondents invested in farm improvement. As shown in Table 3, these inputs varied a great deal by region. Veterinary services were viewed by farmers as the most important husbandry input to give, with the exception of Bale: Between 62% (Gurage) and 94% (Woldia) were seeking veterinary care, whereas improvement of breed genetics and improvement of feed, both assets contributing to increasing animal productivity, were perceived as less important, with a maximum of 11% respondents in favor of breed improvement and 34% favoring feed improvement. No husbandry improvements were observed in the Bale Mountains. However, only 40 farmers were interviewed, and thus these figures do not necessarily reflect the reality in that region. Only 8% of farmers mentioned having alternative off-farm income source.

Survey of farmers' perceptions and objectives

This survey included 69 interviews in 16 villages from 5 Kebeles in the Gurage region (Meskan) and 79 interviews in 22 villages from 6 Kebeles in Woldia (total questionnaires: 148).

Cattle population: Change in herd size over time differed between the 2 regions: 41% of respondents in Meskan answered that their herd was now larger than in the previous 10 years, due to purchase, birth, and gifts from nongovernmental organizations (NGOs) and the government. Only 20% of farmers reported smaller herds than in the last 10 years. By contrast, 44% of Woldia farmers stated that they had to decrease their herd size

TABLE 2 Number of oxen kept per household and percentage of households with few to several oxen.

Number of oxen	Number of households keeping oxen	Percent of households keeping oxen
0	113	21
1	148	27
2	211	39
3	32	6
4 and more	37	7
Total	536	100

TABLE 3 Farm input by region in percent of respondents.

Farm input	Gurage region ($n = 172$)	Woldia ($n = 189$)	Bako Gazer ($n = 135$)	Bale Mountains ($n = 40$)
Veterinary care	62	94	78	0
Improvement of cattle housing	11	4.6	0	0
Improvement of breeds	11	7	0	0
Improvement of feed	34	6	2	0

over the years due to diseases, drought, and severe feed shortage. Only 18% had more cattle by comparison with past years. The majority of farmers in both regions (73% in Woldia, 56% in Meskan) stated that stocking density on communal land was too high, leading to overgrazing and degradation of pastures.

Pastures: No pasture management system was in place in Woldia and Meskan. Figure 3A shows the answers of respondents from both regions concerning the current, past, and future availability of pasture forage for their livestock. The majority of farmers in both regions acknowledged a current lack of grazing land, which would dramatically worsen in the future and overstocking/overgrazing of pastures. The reasons for pasture shortage as perceived by farmers are given in Figure 3B. The major reason given by over 60% of respondents from both regions was clearly increased cropland. All interviewed farmers said that land used for crops was greater in surface area than the grazing land they could access. Farmers were not able to provide absolute figures for surfaces, and the statements relied on their perception of changes in land use. Most Woldia farmers (91%) mentioned that they had cropland 4 times and more the size of pastures, while only 62% of Gurage farmers mentioned having this proportion. Only 16% of farmers in Meskan and 3.7% in Woldia thought that a greater cattle population was a limitation to available pastures. In Woldia, drought was said to be an important source of shortage of grazing land (31.5% of respondents). Decreased land fertility was not seen as a reason for shortage of grazing land in Woldia, and only 1.6% of Gurage respondents observed a decrease in land fertility.

Problems and benefits of communal grazing were assessed with farmers from Meskan only (Figure 4A, B). Shortage of forage and animal emaciation were seen as the main drawbacks of communal grazing by a quarter of the respondents. One third perceived easy herding as a major benefit of communal grazing.

Water resources: Rivers and lakes were mentioned as the main water sources for all Woldia farmers and 60% of Gurage farmers. Because of the often long walk to watering sources, 57% of herds in Meskan and 75% of herds in Woldia were watered only once a day. Forty-four percent of Gurage farmers complained about regular shortage of water. The main complaint was that water was diverted by richer farmers for field irrigation (37.5% of respondents), followed by seasonal droughts (25% of respondents) and human water consumption (19%).

FIGURE 3 (A) Grazing availability for livestock and (B) reasons for grazing shortage, as perceived by Gurage and Woldia farmers.

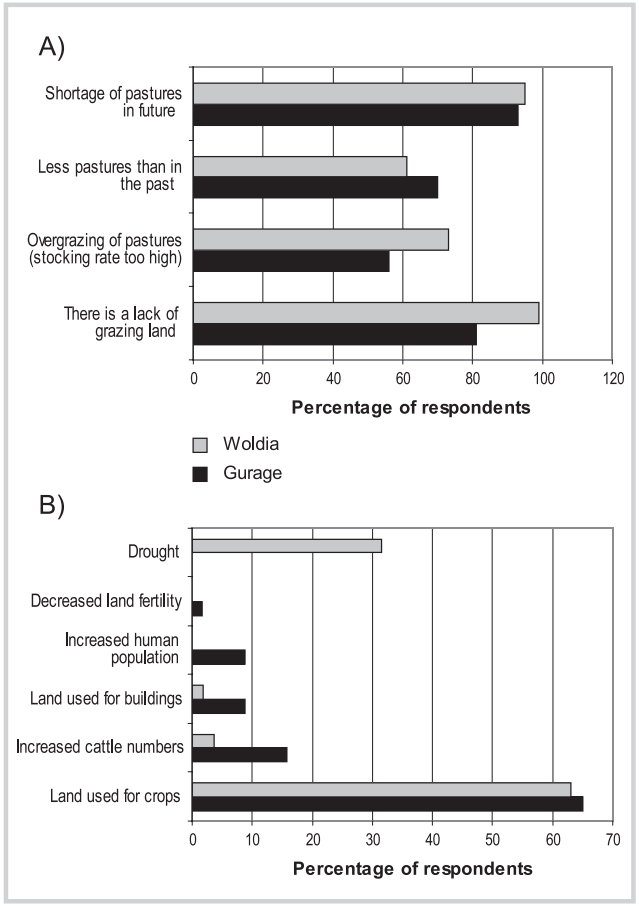


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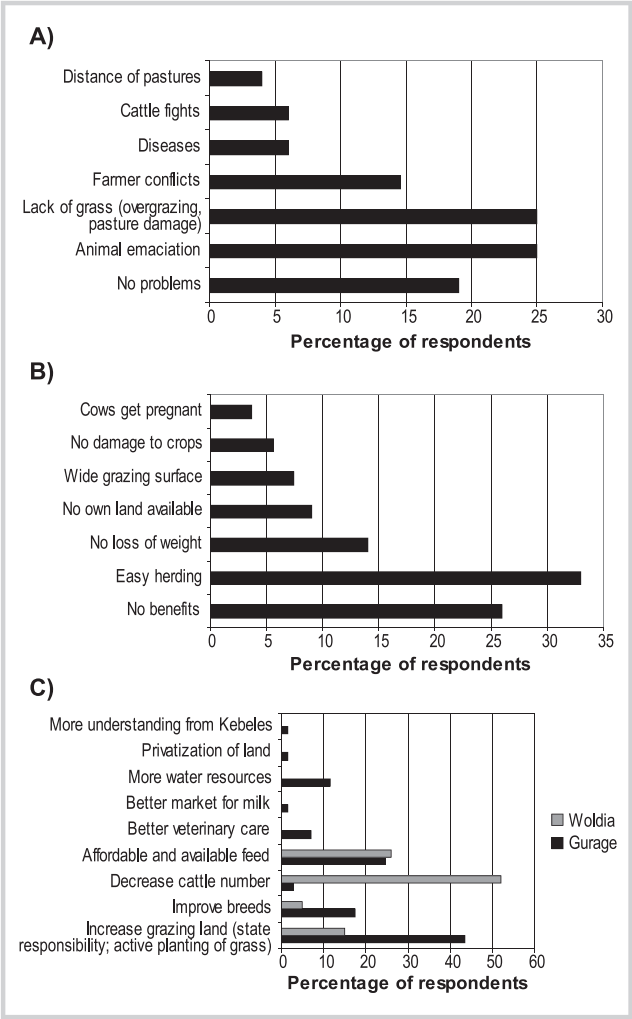
FIGURE 4 (A) Problems and (B) benefits of communal grazing as perceived by Gurage farmers and (C) measures proposed by Woldia and Gurage farmers (multiple answers possible).



During drought periods, water access for livestock was said to have been restricted for 16% of the interviewed households. Problems related to common watering were reportedly infestation of cattle by leeches (25% of respondents) during the dry season and long walking distances to water sources (21% of respondents), whereas disease and injuries from fights were rare (4%).

Conflicts: Twenty-two percent of farmers in Meskan and 44.3% in Woldia declared that communal grazing land was also used by farmers from other villages. Conflicts over grazing land were mentioned by 23% of respondents in Meskan but only by 4% of Woldia farmers. In Meskan, half of the conflicts involved fellow farmers from the same or from other villages sharing natural resources, and half of the conflicts involved Kebele authorities. Farmers said they reacted with oral complaints. Friction over water resources was mentioned by 18% of Gurage respondents.

Priorities and measures for the future proposed by farmers: Figure 4C shows farmers' priorities and objectives for the future. These varied between the regions. Less than half of the farmers wished to have more pastures available. In Meskan region, 44% of Gurage farmers considered that additional grazing land should simply be provided by the government. The next 2 prioritized managerial improvements were improved breeds (17% of respondents) and having access to available and affordable supplementary feed (25%). Decreasing herd size was not seen as a major option by Gurage farmers (only 3% of respondents), whereas half of the Woldia farmers saw this as the major measure to overcome land degradation.

Discussion

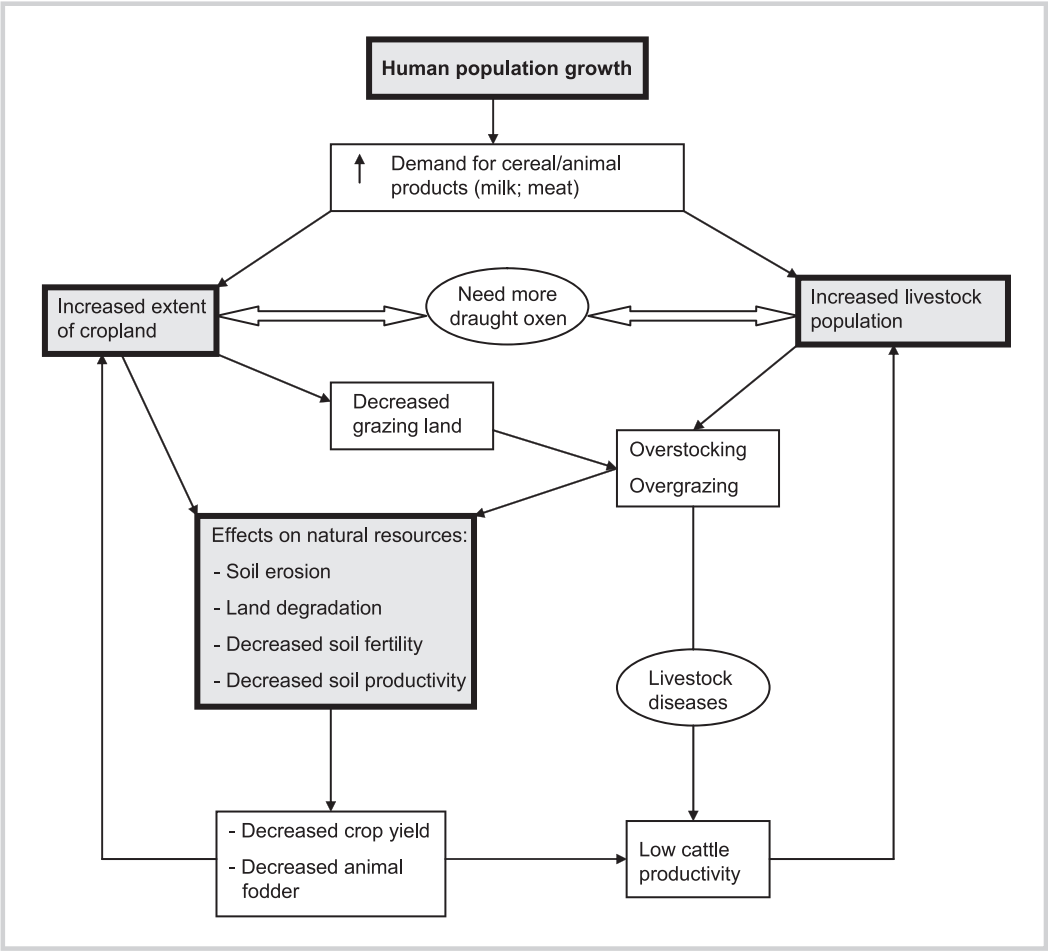
Ethiopia is a country dependent on its agricultural sector, which is characterized by low productivity. Traditional production systems have led to severe land degradation, resulting in decreased feed resources for both human and livestock. Currently, human and livestock populations are simultaneously increasing rapidly, using more resources than in the past and putting increasing pressure on land (Figure 5) (Nyssen et al 2009).

Data from the Central Statistical Agency (CSA) have shown that over the last decade cropland has increased at the expense of grazing land (CSA, 1996a, 2001, 2007b). Ever-decreasing grazing land combined with a rapidly growing livestock population of over 90 million head (CSA 2007a) is likely to lead to massive overstocking and overgrazing of available pastures and increased land degradation. This national situation correlates with data from our study: 41% of interviewed Gurage farmers stated that while their herd size was now larger than 10 years ago, their grazing land had decreased massively in favor of cropland, thus further increasing the stocking rate. All interviewed farmers, regardless of region, stated that they needed to prioritize cropland to feed their growing families.

The majority of the Gurage and Woldia farmers complained about the current situation regarding lack of pastures to accommodate their animals and about overstocking/overgrazing problems. Farmers' perceptions regarding other reasons for lack of grazing land and forage in the future—besides increasing cropland—differed by region. Woldia farmers considered drought to be a major constraint on both grazing land and herd size, whereas Gurage farmers considered the increasing human population to be a major constraint, since it is linked in their view with increasing livestock and more land needed to build infrastructure.

None of the farmers in Gurage or Woldia perceived land degradation and subsequent decreased land fertility as a problem. Research has shown, however, that overstocking damages land, but kept in optimal numbers,

FIGURE 5 Simplified flow chart summarizing the traditional low-intensity crop–livestock system in Ethiopia and its relationship to natural resource dynamics. (Flow chart by Rea Tschopp)



livestock contribute through accumulation of manure to increased biomass production on grazing land (Tadesse et al 2002, 2003). In our study, manure was collected from the fields as a primary source of fuel and/or income and thus was used only partially for soil fertilization (only 21% of respondents used it as fertilizer). Less than 2% of the farmers interviewed understood decreased soil fertility of pastures to be one reason for feed shortage. Water shortage was perceived as a much bigger problem than shortage of grazing land.

Overall, farmers relied almost entirely on forage from natural pastures to feed their animals, with only 1.3% of respondents purchasing feed. Communal grazing was perceived by the interviewees as providing more benefits than problems despite the associated lack of forage. Poor nutritional status contributes to low animal productivity. To compensate for low individual productivity, farmers tend to increase their herd size, as shown in the Gurage study, which in turn puts more pressure on pastures. Only external factors such as severe drought, as shown in the Woldia case, lead to herd depletion through sale and death. Such events may in turn force some of the farmers to use communal land for cereal cropping in order to survive, thus further decreasing available grazing land, as well as soil fertility due to lack of manure.

Farmers' stated solutions to the overstocking/overgrazing problem differed depending on the region: Woldia farmers said they wished to have fewer but more productive animals, which in turn would reduce the need for grazing land. On the other hand, Gurage farmers were asking local authorities for more pastures, as if land was an expandable commodity. They also considered more productive breeds as a priority but were not willing to reduce their herd size. Agricultural extensification rather than intensification was clearly the preference of these farmers. Finally, they wished to have greater access to water resources. Both Woldia and Gurage farmers also saw the need for increased and affordable supplementary feed.

No household-level or community-based land-use management was reported in the 2 study areas. Our study also highlighted the fact that interviewed farmers did not fully perceive the limitations of existing natural resources,

that is, the complete cause–effect chain, and the full extent and implications of overgrazing, land degradation, future availability of feed, and sustainability of natural resources. This contrasts with the attitude of rural communities in other parts of Ethiopia (eg pastoralist communities in Afar or Borana, in Tigray), who have a long tradition of restrictive regulations of grazing areas at village level and an understanding of the limitations of existing natural resources and consequently the need for managing them (Gebremedhin et al 2004; Abule et al 2005; Edossa et al 2005).

In Tigray, a region with extreme land degradation, agricultural intensification and conservation agriculture have proved to be one solution to the aforementioned agricultural trap, as revealed by participatory research (Astatke et al 2003; Nyssen et al 2009). Conservation agriculture, which combines social and economic benefits from integrating production and protection of the environment, is a relatively new concept, especially in Africa (Dumanski et al 2006). The goal of conservation agriculture is sustainability in farming systems and thus food production and security of livelihoods (Govaerts et al 2008). Rockstrom et al (2009) showed that conservation agriculture practices in Ethiopia increased crop yields when compared to traditional practices. These yields additionally increased when fertilizer was added. Further examples in Tigray include increased field irrigation systems (Nyssen et al 2009), terracing and stone bunds on slopes (Nyssen et al 2007), catching and storing runoff water in ponds (Fekadu et al 2007), and rehabilitation of degraded land by exclosures and thus limitation of uncontrolled and free grazing that further damages land (Mekuria et al 2007). However, conservation agriculture, being a complex multicomponent technology, requires adaptation to local farming systems prevailing in different regions of a country, and/or in different agro-ecological areas (Govaerts et al 2008).

Decreased feed availability on overstocked/degraded communal grazing land as seen in this study is likely to have direct impacts on animal health; this is reflected by animals showing poor body condition, decreased productivity, and decreased resistance to diseases (Pandey et al 1993; Mishra et al 2001). Communal grazing also directly intensifies the risk of disease transmission between animals and increases the parasitic load on pastures (Lefèvre and Blancou 2003). A quarter of the interviewed farmers perceived communal grazing to be associated with animal emaciation, but only 6% of them saw a possible link with diseases. The increasing livestock population also strains the scarce veterinary services available in the country. Official figures show that only 2 million cattle (4.6%) were vaccinated nationwide in 2007 (CSA 2007a). In contrast, half of the interviewed farmers in our study stated that they regularly vaccinated their animals. This discrepancy can be explained by the fact that the latter farmers had better access to veterinary care services than farmers from other regions, such as pastoralist zones. Their statement may also have only included valuable animals, such as oxen, and not their entire herd. The need for increased veterinary care was clearly one of the major priorities for husbandry improvement given by most respondents (62% of Gurage and 94% of Woldia farmers).

Friction over scarce natural resources exists in most of Ethiopia. In some areas, the different players manage to reach agreements (Nyssen et al 2009), whereas in others conflict and violent clashes occur, such as in the Awash River basin (Edossa et al 2005) and the Gambella region (Sewonet 2003; Reuters 2008). Verbal friction was described by 23% of Gurage respondents in our study, half of which involved the relevant Kebele authorities, who were said to have not taken their needs seriously. Farmers' attitudes in this study site stress the lack of collective action at village level to cooperate in resource management and the fact that farmers rely on the authorities to improve the situation.

Ethiopia has the largest livestock population in Africa, with 1 head of cattle for less than 2 people. Furthermore, within the cattle population, males account for half of the total herd structure at the national level (CSA 2007a) and in our study. Destocking cattle herds seems to be the logical solution to decrease the economic and ecological burden on the agricultural sector. In urban areas, farmers have switched to more productive and intensive systems, including highly productive exotic dairy breeds in order to supply big cities with the increasing demand for milk. However, highly productive exotic breeds and their crosses currently account for only 1% of the total cattle population, and demand for milk is still much higher than the supply; moreover, animal feed remains unaffordable, and grazing areas are lacking (CSA 2007a, 2007b; SNV 2008).

In rural areas, traditional production systems rely entirely on animal power. Increased cropland will in turn lead to a need for more draught animals and thus to stagnation in the agricultural system and further exacerbation of pressure on land, implying further degradation (Figure 5). Taking into account animal losses and the minimum age at which animals can be used as draught animals, currently each household realistically needs to maintain a minimum herd size of 8–10 animals to permanently secure at least 2 oxen for plowing (Sandford 1982). The majority of farmers in our study possessed 2 oxen, and 12.5% of the respondents even had 3 and more oxen. Draught animals worked more than 6 months per year (plowing and threshing), making it difficult to share working animals among farmers and thus decrease the number of oxen in a village. Cows are primarily kept to produce the next male generation for draught power rather than for milk production. Improvement of breed genetics, as encouraged in urban and peri-urban areas to increase productivity, and thus decrease animal numbers, is not a solution for these essentially ox-production systems. This is also reflected in

the farmers' attitudes in our study. Regardless of fodder availability, only 11% of Gurage and 7% of Woldia farmers said they would like to have improved breeds with better productivity. Moreover, our study showed that overall no efforts were made for livestock housing and feed supplementation as alternatives to natural grazing.

However, even in these traditional production systems, research has shown that strategies can be used to decrease the oxen population necessary for production. Astatke et al (2003) showed that modification of the traditional plow reduced tillage and soil erosion. These authors reported 50% less draught animals required compared to the traditional plowing system. Aune et al (2001) have also discussed potential alternatives to ox-plowing in Ethiopia, such as hoe tillage, zero tillage, and cow traction.

Finally, increasing the export capacity for live animals and meat may help decrease the livestock surplus. Around 350,000 cattle and 1.2 million small ruminants are exported annually (FAO 2007). However, the export industry is still underdeveloped in Ethiopia, and most trade is informal (cross-border) from pastoralist areas (Little 2005). These areas are also the main suppliers of animals to export abattoirs, and exporters help destock their herds during times of crisis (eg severe drought).

Conclusions

Livestock remain the most important component in Ethiopian farmers' lives for daily survival and economic security. However, cereal cropping is highly prioritized at government and farm level at the cost of the livestock subsector, the environment, and natural resources. The introduction of conservation agriculture and rehabilitation of degraded land in parts of the country has shown benefits in economic and ecological terms compared to the traditional agricultural system. However, these strategies work best when they are community- or village-driven. This study showed that the perceptions and attitudes of farmers toward agriculture (cropping and livestock) and natural resources in our study sites, as well as their priorities for future livelihoods, diverged greatly depending on the region. It also highlighted the lack of understanding among these farmers regarding the causes and consequences of land degradation, and their lack of insight into the current unsustainability of their farming system, which jeopardizes future sources of food for both humans and livestock. We thus conclude that there is a need for increased community-based awareness and participatory trials with conservation agriculture in the study areas.

ACKNOWLEDGMENTS

We are very grateful to the Wellcome Trust (UK) for funding this study, which was done in collaboration with Swiss National Centre of Competence in Research (NCCR) North-South. We thank Armauer Hansen Research Institute (AHRI/ALERT) (Addis Abeba) for logistic and data management support. We also thank Lina Gazu, Mesgebu Asmro, Bamlaku Tilahun, and Alemayehu Kifle for their valuable help and support during fieldwork. Our thanks also go to all the villagers who were willing to participate in this study. We are grateful to Anne Zimmerman for her help in editing the manuscript, as well as the anonymous reviewers for their valuable comments.

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