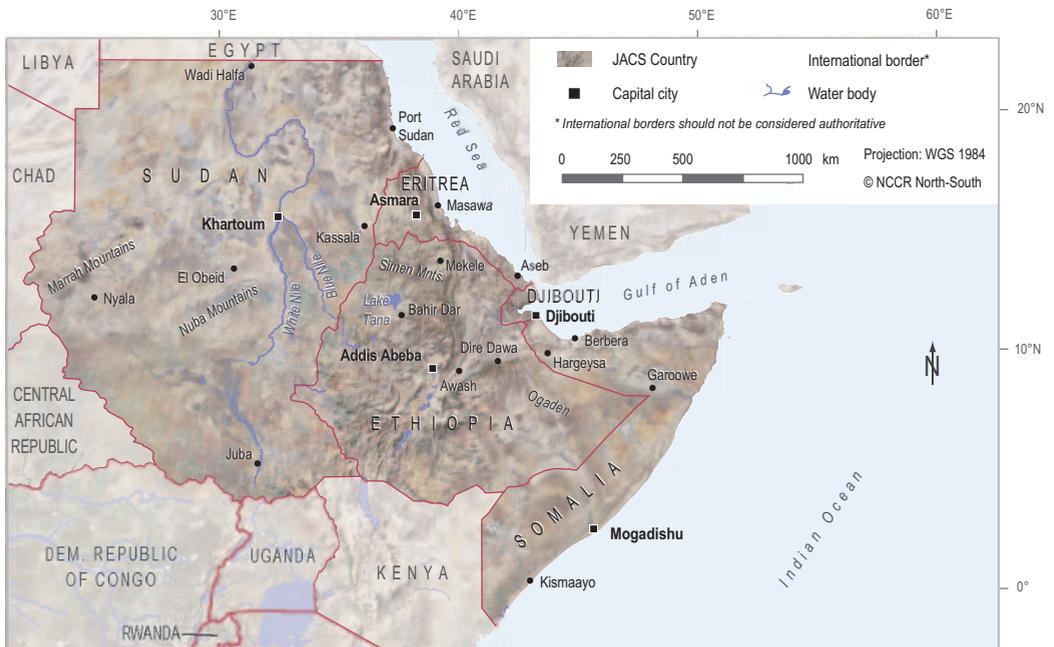


Part III

Development Challenges and Mitigation Pathways in the Horn of Africa





9 From Institutional Constraints and Ethnic-related Conflicts to Better Governance of Natural Resources in the Horn of Africa

Berhanu Debele¹

9.1 Introduction

A large number of core problems hinder development in the region of the Horn of Africa (Yacob Arsano et al 2004), which has both highland and lowland contexts and includes the five countries of Djibouti, Eritrea, Ethiopia, Somalia and Sudan. These countries are socially, economically and ecologically diverse and, at the same time, are related geographically, historically and demographically. The region is known for its long history of armed conflict, massive influxes of refugees, weak state capacity and governance, and contradictory policies (Hagmann and Alemmaya Mulugeta 2008). Moreover, colonial boundaries add to the political instability of this region, in many parts of which the movement of persons and exchange of goods across borders are integral parts of local livelihoods. The region is highly food insecure, owing to recurrent droughts and natural disasters that hamper crop and livestock production. Core problems are conflict in the lowlands and degradation of natural resources in the highlands (Yacob Arsano et al 2004). There are many general interconnections among these broad categories of problems and syndromes. For example, poor governance and limited alternative livelihoods lead to excessive mining of natural resources, which in turn leads to soil erosion, land degradation and loss of biodiversity (see Chapter 12 in the present volume). This situation culminates in poverty, insecure livelihoods, weak socio-economic infrastructure and migratory movements.

But the region does not only have problems. It also has potentials, such as favourable climatic conditions – moderate temperatures and adequate rainfall for crop production and animal rearing – in the highlands. The lowlands have potential for livestock and biofuel production as well under the prevailing extensive production system, and an even better potential for irrigated agricultural production both for domestic consumption and for export (tropical fruits, vegetables, flowers, industrial crops such as sugar cane, and others).

A considerable amount of research has been done in the Swiss National Centre of Competence in Research (NCCR) North-South's Joint Area of Case Studies (JACS)² Horn of Africa (HOA), which covers all five countries in the Horn of Africa, to shed light on the causes of the core problems mentioned above, as well as pathways to mitigating them. Research was grouped around three major themes: conflicts in the pastoral areas; water management and conflict transformation; and land degradation and sustainable land management in the highlands. These thematic groupings were the basis for selection of three synthesis themes: 1) *Pastoral Conflicts and State-building in the Horn of Africa*; 2) *Water Management and Conflict Transformation in the Horn of Africa*; and 3) *Land Degradation and Sustainable Land Management in the Highlands of Ethiopia*.

The lowlands of the Horn of Africa are inhabited by pastoralists (Afars, Somalis, Oromos, Benamirs, and others). Conflict is a common phenomenon among these ethnic groups. There are several reasons for this. Many scholars are of the opinion that this conflict is over access to and use of scarce natural resources (Hagmann 2006). Research topics under the theme *Pastoral Conflicts and State-building in the Horn of Africa* were generally chosen to prove or disprove this hypothesis and also to identify pathways to mitigating the problems observed. A total of 13 studies (3 post-doctoral, 3 PhD and 7 Master's projects) were carried out in the lowlands from different perspectives.

The fundamental reason for conflict among the riparian states of the Nile Basin is unfair apportionment of rights to water use, especially for agricultural production (Luzi 2007). It is believed that eminent conflict over this resource will result in the future unless appropriate action is taken on the basis of prevailing realities. The absence of properly formulated water policies in the states concerned has led to increased tensions and conflicts, even among local users (Luzi 2007; Moges Shiferaw 2007). The team of researchers examining these problems grouped under the theme *Water Management and Conflict Transformation in the Horn of Africa* produced 9 studies (4 PhD and 5 Master's projects).

The alarming rate and extent of land degradation in the highlands, as well as pathways to its mitigation, were the focus of study under the theme *Land Degradation and Sustainable Land Management in the Highlands of Ethiopia*. Encroachment of cultivation onto steep slopes and into areas inhabited by wildlife and forested areas continues to increase, while the size of landholdings and fallow periods have declined due to population growth (Hurni

2005; Ludi 2005). Productivity decline has meant that production is insufficient even for subsistence economies. A total of 30 studies (2 post-doctoral, 2 PhD and 26 Master's projects) were conducted to examine these issues.

The main purpose of synthesis work is to generate value added beyond the findings of the individual studies, by rendering a holistic picture of the research endeavours undertaken for each theme and thus revealing additional findings that may not have been clearly visible from the individual studies alone. The study approaches for research on the three themes outlined above were chosen such that:

- Some studies were done in tandem arrangements;
- Study areas for different themes overlapped;
- Similar topics were studied in different areas;
- PhD-level studies were associated with Master's-level studies (which treated specific aspects of the PhD-level studies);
- The research topics chosen correlated directly with the core problems as they were identified in multi-stakeholder workshops at the outset of the NCCR North-South programme (Yacob Arsano et al 2004).

9.2 Main research outputs

During the first phase of the NCCR North-South programme, 6 post-doctoral, 9 PhD and 38 Master's projects were implemented, along with 6 Partnership Actions for Mitigating Syndromes³ (PAMS; see Table 1 for a brief description of each of these projects). These studies produced significant results that led to a deeper understanding of the nature of the problems facing the region as a result of global change, and made it possible to identify pathways to mitigating them.

The results synthesised under Theme 1, *Pastoral Conflicts and State-building in the Horn of Africa* (see Chapter 10 in the present volume), reveal that although pastoral (lowland) area resources have been degrading and diminishing since the 1990s, the violent inter-group conflicts that took place there were mainly the result of inadequate power relations between the state and the customary authorities (Hagmann 2006; Alemmaya Mulugeta 2007; Figure 1). The state is only nominally present in these areas, since it lacks the required resources – especially qualified personnel – and is therefore unable to exercise its authority. Indeed, the state was found to play more the role of

Table 1

Selected Partnership Actions for Mitigating Syndromes (PAMS) carried out in the Horn of Africa (HOA), and their main outcomes.

Title	Location and duration	Main outcomes
<p>HOA-2: Mitigating the Impact of Resource-based Violent Conflict in Gambella Regional State, Western Ethiopia</p>	<p>Gambella, Ethiopia</p> <p>12 months</p>	<p>Conflict prevention and awareness-raising activities had an immediate mobilising effect on the community.</p> <p>Service-based interventions (training in upgrading of skills and provision of safe drinking water) responded to the immediate needs of the community, leading to reduced occurrence of conflicts between sub-clans.</p>
<p>HOA-6: Practising Sustainable Land Management Options for Improved Livelihoods of the Rural Community, Lake Tana Basin (LTB), Ethiopia</p>	<p>Amhara Region, Ethiopia</p> <p>(Conder in Arenkaya watershed and Gojjam in Genet watershed)</p> <p>6 months</p>	<p>Watershed maps were produced; bio-physical and socio-economic baseline data collected; priority activities, based on the needs of farmers, identified; nursery sites established; seedlings raised and distributed to farmers; basic equipment purchased; and farmers taken on visits to other areas where watershed management has been successfully implemented.</p> <p>Sustainable land management was initiated. Combating land degradation had always been perceived as the responsibility of the government, i.e. the legal owner of the land, and not the farmers, who merely used the land. This PAMS initiated a process of self-reflection, and farmers in the project area became eager to participate in safekeeping of the land they use.</p> <p>Both scientists and non-scientific actors involved in the project learned from each other.</p>
<p>HOA-8: Nile Capacity Building Forum on Water Development and Cooperation</p>	<p>Ethiopia, Sudan, Egypt</p> <p>(The workshop was held in Addis Abeba, Ethiopia)</p> <p>1 week</p>	<p>10 participants from Egypt, Sudan and Ethiopia (Master's-level students, young professionals in water ministries and foreign ministries, other employees) were brought together in a workshop.</p> <p>The objective of the workshop was to enhance the knowledge and capacity of the participants. The aims were 1) to increase knowledge about hydro-political cooperation; 2) to increase skills related to communication, diplomacy, conflict analysis, negotiation and conflict transformation; and 3) to understand the different Egyptian, Ethiopian and Sudanese perceptions, and exchange perspectives.</p> <p>Four days of interactive work created an atmosphere of understanding among the participants from the 3 countries, who were known to have diametrically opposed positions regarding use of the waters of the Nile.</p> <p>The forum provided an excellent opportunity for knowledge-sharing among the participants, including the facilitators. It can be said that this constituted a mutual learning process.</p>

a spoiler than a role characterised by constructive engagement (Hagmann 2006). This fact, coupled with the breakdown of customary institutions, has led to open-access resource tenure of communal property.

Moreover, ‘ethnic federalism’ has reinforced the domination of powerful pastoral groups over weaker ones, leading to politicisation of resource use in the lowlands as pastoralists equated the concept of ‘majority rule’ with ‘exclusive resource control’ (Getachew Kassa 2005). For example, the Ethiopian government in place since 1991, recognising weaknesses in structure and staffing and engaging in a face-saving exercise, regularly established ‘joint peace committees’ composed of local government officials and elders to resolve violent pastoral conflicts (Ayele Gebre Mariam 2007).⁴ However, these groups often deliberately engineered and perpetuated pastoral area conflicts in order to obtain political and financial gain from such tension and violence (Hagmann 2005a, 2005b). These findings are highly significant and contradict the widely held view of ‘herder–farmer conflicts’.

Regarding Theme 2, *Water Management and Conflict Transformation in the Horn of Africa* (see Chapter 11 in the present volume), it became appar-



Fig. 1
Livestock grazing in the Awash Basin, Ethiopia, is facing pressure from irrigation agriculture as well as from claims of the Awash National Park. Mitigating these pressures on the pastoralist people's ecological and social system is a key focus of research done in the Horn of Africa by the Swiss National Centre of Competence in Research (NCCR) North-South. (Photo by Brigitte Portner, 2006)

ent that disputes over the utilisation of water resources (national and international) are not primarily a function of the physical availability of water, but rather of users' access to it, which is determined by policies, institutions, and technological capacities (Luzi 2007; Moges Shiferaw 2007; see also Chapter 11 in the present volume). Moreover, the efficiency of agricultural production is not a function of the physical availability of water, but of access to water and the security of water entitlements (Moges Shiferaw 2007).

The conflict in the Nile Basin is driven by four main claims: 'equitable allocation', 'prior use rights', 'national sovereignty', and 'agricultural water demands' (Mason 2004). All Nile countries set their water resources development targets unilaterally, without due consideration of demand and supply in the other riparian countries. This is a consequence of the lack of basin-wide legal and institutional agreements to regulate allocation, utilisation and conservation of water resources (Figure 2). The main conflict parties are riparian states at the basin level, and farmers or farmer communities at the local level. The mitigation aspect of the studies conducted in the Nile Basin is prominently illustrated by four problem-solving dialogue workshops organised by the researchers involved in 2002–2004 (Yacob Arsano 2004; Mason 2004).

Fig. 2
The Blue Nile River during the rainy season: A situation in 2009 where most runoff from Lake Tana is diverted for hydropower production (A) and a situation in 2006 where all water is flowing over the fall (B). Negotiating Nile water management is a crucial but complex international issue addressed both tacitly and explicitly. (Photos by Hans Hurni and Veronika Elgart)



The synthesis work done on Theme 3, *Land Degradation and Sustainable Land Management in the Highlands of Ethiopia*, clearly illustrated that debates over explanations of the land degradation process as well as the search for mitigation options were clustered around the approaches taken, priorities and agenda setting, and identification of the root causes (see Chapter 12 in the present volume). All studies on land-use and land-cover changes and underlying causes identified highly dynamic systems of change (Amare Bantider 2007; Birru Yitafaru 2007). The rapid loss of forest cover, diminution of the wildlife population and its habitats, and the expansion of cultivation in the recent past coincided with land policy and institutional changes in the 1970s, 1990s and early 2000s (Amare Bantider 2007; Birru Yitafaru 2007). Periods of active deforestation also correlated with phases of rapid population growth (Amare Bantider 2007). These were again coupled with little institutional concern about or insufficient enforcement of measures to combat environmental degradation.

Soil erosion by water remains a major threat to agricultural production. The most important bio-physical determinants of soil degradation are vegetation cover and agricultural management practices (Amare Bantider 2007; Birru Yitafaru 2007). Decrease in soil cover has been the most important driver of increasing soil erosion rates. As Ethiopian farmers do not perceive soil degradation as an agricultural problem, their responses to soil degradation have been remarkably minor. Government-induced soil conservation efforts are estimated to be effective on less than 10% of the area requiring attention (see Chapter 12 in the present volume).

The above results are significant contributions to regional development efforts. Outcomes already observed include: a) adoption of some research findings in the curricula of academic institutions (e.g. Political Science and International Relations Department of Addis Abeba University); b) renewed importance of sustainable land management and soil and water conservation practices at most universities (e.g. Haramaya, Mekelle, etc.) and government institutions; and c) findings relating to government policy issues that are expected to stimulate governments to revisit their policies of adjustment.

9.3 Outlook for future research

The most widespread and urgent problem in the region is limitation of livelihood options for the largely agrarian population. This situation leads to

excessive mining of the available natural resources, resulting in their degradation and even greater poverty among the population. Hence the major challenge, both for research and for development, is creation and development of alternative means of livelihood such as ecotourism, handicrafts and rural industries, as well as strengthening of rural–urban linkages and payment for environmental services (in addition to identification and promotion of easily adoptable conservation measures and workable policies). Integrated and concerted efforts will need to be made on this issue by researchers concerned with natural resources and by social scientists.

Most of the governments in the region do not command the trust and confidence of their populations, as they were not elected democratically. Nor do the governments trust the people. Consequently, governments are sensitive about studies undertaken in the field of social sciences. To overcome this problem, research topics were often camouflaged to avoid negative reaction and resistance.⁵ Moreover, researchers were met with suspicion by both the people and the government – the people considered them government spies, while governments considered them agents of opposition parties or spies for foreign countries. This made work extremely difficult for the researchers. Research into means of confidence-building and enhancing institutional stability are thus among the areas to be focused on in future. Furthermore, frequent change of government structures has led to feelings of uncertainty and to loss of data and institutional memory.

The other major challenge is the refusal of riparian states to accept the objective realities of each other's situations while pursuing only their own agendas, although the needs of other parties are clearly known and need to be addressed as well. Nonetheless, this situation is better appreciated and understood at the private individual level. Here the promising results obtained through the 'Nile Forum' PAMS (see Table 1) should be pursued and further developed.

Framework conditions for collaboration are now established: an agreement on capacity building and research partnership was signed between Switzerland and Ethiopia in 2008. This provides ample opportunity for expanding and strengthening already initiated informal collaboration with a large number of academic institutions (local as well as regional and international), government institutions, and other bilateral and multilateral institutions and organisations, including NGOs.

Endnotes

Full citation for this article:

Berhanu Debele. 2010. From institutional constraints and ethnic-related conflicts to better governance of natural resources in the Horn of Africa. *In: Hurni H, Wiesmann U, editors; with an international group of co-editors. Global Change and Sustainable Development: A Synthesis of Regional Experiences from Research Partnerships*. Perspectives of the Swiss National Centre of Competence in Research (NCCR) North-South, University of Bern, Vol. 5. Bern, Switzerland: Geographica Bernensia, pp 151–161.

Acknowledgements:

The author acknowledges support from the Swiss National Centre of Competence in Research (NCCR) North-South: Research Partnerships for Mitigating Syndromes of Global Change, co-funded by the Swiss National Science Foundation (SNSF), the Swiss Agency for Development and Cooperation (SDC), and the participating institutions.

¹ Berhanu Debele is Regional Coordinator for the Swiss National Centre of Competence in Research (NCCR) North-South in the Horn of Africa (Joint Area of Case Studies Horn of Africa or JACS HOA).

Address: Regional Coordination Office, JACS Horn of Africa
Haile Gebre Selassie Avenue, Bole Sub-city, Kebele 06
House No 510
Addis Abeba
Ethiopia

E-mail: nccrhorn@ethionet.et

² The NCCR North-South is based on research partnerships with researchers and research institutions in the South and East. These partnership regions are called JACS (Joint Areas of Case Studies). Regional Coordination Offices (RCOs) were established in each of these JACS at the outset of the programme. The original function of the RCOs was to coordinate research; in the third phase of the programme, RCOs will consolidate the existing research network in the South and will become hubs for generating new research projects and partnerships.

³ Partnership Actions for Mitigating Syndromes (PAMS) are projects implemented by local actors together with scientific and non-scientific stakeholders. As a component of the NCCR North-South programme they are designed to implement and validate approaches, methods and tools developed in research, with a view to finding promising strategies and potentials for sustainable development. Moreover, they are intended to promote mutual learning and knowledge-sharing between academic and non-academic partners in sustainable development.

⁴ These committees are paid by the government for the services they render; thus, membership in a 'joint peace committee' is often a lucrative business.

⁵ The situation was difficult during the first two phases of the NCCR North-South programme, as the Regional Coordination Office of the JACS HOA could not legally be established until Switzerland and Ethiopia signed a bilateral research framework agreement on 27 November 2008. The Regional Coordination Office was formally recognised on the occasion of the first meeting of the two countries' Joint Committee on 10 February 2009 in Addis Abeba, Ethiopia.

References

Publications elaborated within the framework of NCCR North-South research are indicated by an asterisk (*).

- * Alemmaya Mulugeta. 2007. *The Transformation of Conflicts Among Ethiopian Pastoralists: An Ethnography of the Notion of Conflict Among the Karrayu* [PhD dissertation]. Basel, Switzerland: Institute of Social Anthropology, University of Basel.
- * Amare Bantider. 2007. *Landscape Transformation and Opportunities for Sustainable Land Management Along the Eastern Escarpment of Wello (EEW), Ethiopia* [PhD dissertation]. Bern, Switzerland: University of Bern.
- * Ayele Gebre Mariam. 2007. *The Critical Issue of Land Ownership: Violent Conflict Between Abdalla Tolomogge and Awlihan in Godey Zone, Somali Region of Ethiopia*. 2nd, revised edition [2005']. NCCR North-South Dialogue No. 11. Bern, Switzerland: Swiss National Centre of Competence in Research (NCCR) North-South. Also available at: <http://www.north-south.unibe.ch/content.php/page/id/230>; accessed on 23 October 2009.
- * Birru Yitaferu. 2007. *Land Degradation and Options for Sustainable Land Management in the Lake Tana Basin (LTB), Amhara Region, Ethiopia* [PhD dissertation]. Bern, Switzerland: University of Bern.
- * Getachew Kassa. 2005. *Human Security of Minority Groups in South-Eastern Ethiopia: The Case of the Garrimarro Community in Dollo Oddo District, Liban Zone, Somali Regional State of Ethiopia*. Draft research report. Addis Abeba, Ethiopia: Institute of Ethiopian Studies, Addis Abeba University.
- Hagmann T. 2005a. Beyond clannishness and colonialism: Understanding political disorder in Ethiopia's Somali Region, 1991–2004. *Journal of Modern African Studies* 43 (4):509–536.
- Hagmann T. 2005b. Challenges of decentralisation in Ethiopia's Somali region. *Review of African Political Economy* 32 (104–105):449–455.
- * Hagmann T. 2006. *Pastoral Conflict and Resource Management in Ethiopia's Somali Region* [PhD dissertation]. Lausanne, Switzerland: Swiss Graduate School of Public Administration (IDHEAP), University of Lausanne.
- * Hagmann T, Alemmaya Mulugeta. 2008. Pastoral conflicts and state-building in the Ethiopian lowlands. *Africa Spectrum* 43(1):19–37.
- * Hurni H. 2005. *Decentralised Development in Remote Areas of the Simen Mountains, Ethiopia*. Dialogue Series. Bern, Switzerland: Swiss National Centre of Competence in Research (NCCR) North-South. Also available at: <http://www.nccr-north-south.unibe.ch/document/document.asp?ID=3743&refTitle=Horn%20of%20Africa&Context=jacs>; accessed on 25 August 2009.
- * Ludi E. 2007. *Simen Mountains Study 2004: Intermediate Report on the 2004 Field Expedition to the Simen Mountains in Northern Ethiopia*. 2nd, revised edition [2005']. NCCR North-South Dialogue No. 6. Bern, Switzerland: Swiss National Centre of Competence in Research (NCCR) North-South. Also available at: <http://www.nccr-north-south.unibe.ch/document/document.asp?ID=3744&refTitle=the%20NCCR%20North-South&Context=NCCR>; accessed on 25 August 2009.
- * Luzi S. 2007. *Double-edged Hydropolitics on the Nile* [PhD dissertation]. Zurich, Switzerland: Swiss Federal Institute of Technology Zurich (ETHZ).
- * Mason S. 2004. *From Conflict to Cooperation in the Nile Basin* [PhD dissertation]. Zurich, Switzerland: Swiss Federal Institute of Technology Zurich (ETHZ). Also available at: <http://www.north-south.unibe.ch/content.php/filterpage/id/27>; accessed on 27 October 2009.
- * Moges Shiferaw. 2007. *The Economics of Shared Irrigation Water Rights* [PhD dissertation]. Basel, Switzerland: University of Basel.
- * Yacob Arsano. 2004. *Ethiopia and the Nile: Dilemmas of National and Regional Hydropolitics* [PhD dissertation]. Zurich, Switzerland: University of Zurich. Also available at: <http://www.north-south.unibe.ch/content.php/filterpage/id/27>; accessed on 27 October 2009.

- * Yacob Arsano, Berhanu Debele, Ludi E, Seyoum Gebre Selassie. 2004. JACS Horn of Africa: Managing resources and disputes in uncertain environments. *In*: Hurni H, Wiesmann U, Schertenleib R, editors. *Research for Mitigating Syndromes of Global Change: A Transdisciplinary Appraisal of Selected Regions of the World to Prepare Development-oriented Research Partnerships*. Perspectives of the Swiss National Centre of Competence in Research (NCCR) North-South, University of Bern, Vol. 1. Bern, Switzerland: Geographica Bernensia, pp 141–182.

10 Pastoral Conflicts and State-building in the Ethiopian Lowlands

Tobias Hagmann¹ and Alemmaya Mulugeta²

Abstract

This article draws attention to the central role played by the Ethiopian state in reconfiguring contemporary (agro-)pastoral conflicts in Ethiopia's semi-arid lowlands. Contrary to primordialist and environmental conflict theories of pastoralist violence, we shed light on the changing political rationality of inter-group conflicts by retracing the multiple impacts of state-building on pastoral land tenure and resource governance, peace-making and customary authorities, and competition over state resources. Based on an extensive comparative review of recent case studies, post-1991 administrative decentralisation is identified as a major driving force in struggles over resources between transhumant herders in Ethiopia's peripheral regions. Our analysis emphasises the politicisation of kinship relations and group identities and the transformation of conflict motives under the influence of the gradual incorporation of (agro-)pastoral groups into the Ethiopian nation-state. Ethnic federalism incites pastoralists to engage in parochial types of claim-making, to occupy territory on a more permanent basis, and to become involved in 'politics of difference' (Schlee 2003) with neighbouring groups.

Keywords: Violence; pastoralism; state-building; federalism; lowlands; Ethiopia.

This article is a shortened version of an article published in *Africa Spectrum*, which is reprinted here with kind permission of the German Institute of Global and Area Studies:

Hagmann T, Alemmaya Mulugeta. 2008. Pastoral conflicts and state-building in the Ethiopian lowlands. *Africa Spectrum* 43(1):19–37.

10.1 Introduction

With the federalisation of Ethiopia under the stewardship of the Ethiopian Peoples' Revolutionary Democratic Front (EPRDF), the fortunes of its pastoral communities have seized the attention of aid agencies, academics and politicians. The incumbent regime has vowed to 'decolonise' the country's 'backward' or 'emerging' regions where most of Ethiopia's transhumant herders and agro-pastoralists are found. Pastoralist interests have been institutionalised in the House of Peoples' Representatives in 2002 by dint of forming a Pastoralist Standing Affairs Committee that brings together all members of parliament from predominantly pastoralist constituencies (Lister 2004). Following the major droughts of 1995–1997 and 2000–2001, large-scale humanitarian aid and development programmes have been expanded to the eastern, southern and western lowlands, which cover 60% of the territory (Sandford and Yohannes Habtu 2000).

It is within this particular context that one has to situate the discussion about the causes, dynamics and peaceful transformation of pastoral conflicts in Ethiopia and the Horn of Africa. The concomitant degradation and shrinkage of the natural resource base and the proliferation of armed confrontations have paved the way for a "disaster and emergency" discourse (Nori et al 2005, p 12) that associates pastoralism with uncontrolled violence. Numerous studies have reported the militarisation of pastoralist societies, an increase in the severity of resource conflicts, and the augmentation of casualties of warlike confrontations in Ethiopia (Farah 1997; Said 1997; Ayele Gebre Mariam 2001; Getachew Kassa 2001a; Dereje Feyissa 2003; Markakis 2003; Abdulahi 2005). Whether or not one endorses Unruh's statement that "violent confrontation has become more frequent" (Unruh 2005, p 230) in the Ethiopian lowlands, outbursts of pastoralist violence have challenged the federal and regional governments.

This article draws attention to the central role played by the Ethiopian state in reconfiguring contemporary pastoral conflicts. Based on a comprehensive review of recent publications on local resource conflicts and management in the Ethiopian lowlands we elaborate a conceptual perspective on the interrelations between statehood and pastoral conflicts. This analysis also draws on our recently concluded doctoral research on conflict and resource management in Ethiopia's Somali region (Hagmann 2006) and indigenous conceptions of violence among Karrayu pastoralists in the Upper and Middle Awash Valley (Alemmaya Mulugeta 2008). A number of authors have

argued that the state represents a major bone of contention for pastoralists in the Horn of Africa (Markakis 1994). However, to this day, established explanations of pastoral violence tend to propagate a depoliticised interpretation of inter-group conflicts, which are thought to be the product of primordial antagonisms and resource scarcity. In contrast, we argue that pastoral conflicts must be understood within the context of the historical and ongoing expansion of the Ethiopian state from Ethiopia's central highlands to the remoter parts of its peripheral lowlands.

Before expounding on the nexus between pastoral conflicts and state-building, a number of terminological and conceptual clarifications are required in addition to details concerning the scope of our argument. We use 'pastoralism', 'pastoralists' and 'pastoral' to refer to rural dwellers whose livelihood depends predominantly on transhumant livestock or agro-pastoral livestock production. Although marked by important socio-economic and political differences that defy sweeping generalisations, Ethiopia's pastoralists share three broad characteristics. These include a segmentary kinship structure "on the basis of moiety, clan, or lineage", the existence of "age- or generation-grade organisation[s]" and the eminent role played by religious and ritual "mediators, priests, or prophets" in managing public affairs (Abbinck 1997, p 4). Across Ethiopia's regional states a great variety of interactions can be observed between different administrative levels from the *kilil* (regional state) to the *wereda* (district) and the *kebele* (village or sub-location) on the one hand, and pastoral groups' customary institutions and organised political interests on the other hand (Unruh 2005).

10.2 Pastoral land tenure and resource governance

Conflicts over pastoral economies' life-sustaining resources are embedded in the evolution of natural resource management practices and their wider political economy. In the past decade, the Ethiopian state has effectively contributed to the transformation of how pastoral groups relate to their natural environment. Since 1991 ethnic federalism and other public policies have produced more sedentary lifestyles based on more permanent and less flexible territorial boundaries. In many lowland areas the concomitant break-down of customary institutions and the inability of central and local governments to enforce communal property have led to de facto open-access tenure regimes. These open-access regimes promote violent confrontations triggered by multiple claims to the same resource pool.

Over the decades, land tenure policies and state-led development programmes strongly undermined the communal land tenure traditions that characterised pastoral production (Abdulahi 2007). Past government interventions have decreased livestock mobility, promoting sedentarisation, mixed agro-pastoral production, and shorter migration routes of herds in the vicinity of water points. The 1955 Revised Constitution determined that pastoral territory, referred to as *zelan* land, was state property (Yacob Arsano 2000). Starting from the 1960s, consecutive livestock development programmes propagated modern input delivery systems such as veterinary services, water development stock routes, holding ground and marketing facilities (Taffesse Mesfin 2000). In the 1970s these interventions aimed to increase the number of perennial water sources by excavating ponds, dams and shallow wells, drilling boreholes, and building cisterns. The ensuing multiplication of water points weakened customary water and grazing management and triggered rangeland degradation in parts of today's Oromiya (Helland 2000) and Somali regions (Sugule and Walker 1998).

In terms of formal land tenure, "no fundamental differences" (Berhanu Nega et al 2003, p 109) exist between the former *Derg* and the current government, as the latter maintained state ownership of land, including the rangelands. Ethiopia's federal constitution determines that "Ethiopian pastoralists have the right to free land for grazing and cultivation as well as the right not to be displaced from their own lands" (FDRE 1995, Art. 40). Attempts to restore or enforce communal land-holding in the Ethiopian lowlands have been made in the framework of decentralised community-based natural resource management projects. In the 1990s, NGOs began implementing participatory forest management and land-use planning in pastoral areas in order to enhance land tenure security, promote capacity-building in local institutions, and minimise conflicts over the commons (Tache and Irwin 2003). Accelerated by droughts, economic destitution and more intensive patterns of livestock production, the individualisation of resource tenure is concomitant to the erosion of reciprocal grazing rights and a decrease in herd mobility.

An additional and critical dimension of the transformation of dryland resource governance emanates from ethnic federalism. While it is difficult for pastoralists to claim constitutionally enshrined land-use rights, the 'right to self-determination' has been broadly promoted and vulgarised by the EPRDF. The principle according to which political recognition depends on a group's ability to control and claim a distinct area of land encourages conflicts over spatially concentrated natural resources. Despite its name,

Ethiopia's ethnic-based decentralisation (*yaltmakele astedader*) relies on a territorially defined type of federalism, as territory, and not people, is the organising principle of politico-administrative units. As a result, since 1991 resource-based conflicts have become increasingly intertwined with a quest for territorial control for political purposes.

10.3 Co-optation of customary authorities and peace-making

Consecutive Ethiopian regimes have co-opted and partially incorporated customary authorities and their peace-making repertoires in order to uphold security and state interests at the local level. Over time, the formal recognition of selected clan leaders by the imperial and the current EPRDF regimes and – to a much lesser degree – by the *Derg* has multiplied titled elders who compete over the representation of their kin group vis-à-vis local government and aid agencies. After 1991, the regional states' embracement of customary authorities has been particularly visible in the realm of conflict resolution and efforts to maintain or re-establish peace, as ethnographic studies in the Upper and Middle Awash Valley (Alemmaya Mulugeta 2008) and Somali region (Hagmann 2006) demonstrate. Similarly, Kelemework Tafere (2006, p 69) documented how in the Afar region “the state seems to adopt a de facto policy of encouraging the Afar to settle disputes on their own”. The selective state appropriation of local reconciliation mechanisms that fuse customary and religious elements both undermines and ‘retraditionalises’ customary authorities of pastoral groups.

The overwhelming majority of inter-personal and inter-group disputes – both violent and non-violent – in Ethiopia's lowland regions are arbitrated by elders. Customary conflict resolution is deeply embedded in social norms and rituals, and often involves the negotiation and payment of blood compensation. Recent studies have documented these peace-making mechanisms among the Afar (Getachew Kassa 2001b), the Boran (Bassi 2005), the Karrayyu (Alemmaya Mulugeta 2008), the Suri and Dizi (Abbink 2000), and the Somali (Hagmann 2007). With the exception of urban dwellers, pastoralists by and large prefer customary conflict resolution to the formal legal system when resolving disputes and grievances. Various authors have described the local administrations' inability to provide for “lasting solutions” to longstanding resource conflicts at the communal level (Ahmed Ali Gedi 2005, p 46). State officials often lack the necessary evidence to

file charges against the perpetrators, as large parts of the population turn to customary authorities and mechanisms for dispute settlement (Alemmaya Mulugeta 2008).

In cases of highly escalated and protracted conflicts that threaten the institutional architecture of or the power balance within regional states, the federal government – first through the Prime Minister’s Office and later on through the Ministry of Federal Affairs – has established so-called ‘joint peace committees’. The success of these committees, which exist even at the lowest administrative level and are composed of local government officials and elders, has been mixed at best (Abdulahi 2005; Alemmaya Mulugeta 2008). Overall, most government efforts to contain or resolve pastoral conflicts have been characterised by coercion, short-term approaches and limited spatial outreach. In his analysis of herder–farmer conflicts in the Dawa-Genale river basin, Ahmed Ali Gedi (2005, p 31) concluded that “government officials interfere in some disputes which take place in [...] accessible areas, while they often neglect those disputes which take place in remote or distant pastoral areas”.

In the past decade, government-sponsored conflict resolution in Ethiopia’s pastoral areas has effectively commercialised peace-making. In many cases, elders of pastoral communities who engage in mediation and reconciliation are paid either by the government or by NGOs. Conflict resolution thereby became a lucrative activity for customary leaders who implement local government agendas in return for per diems, *khat* and other personal benefits. Many NGOs working in Ethiopia’s pastoral areas assume that conflicts arise from resource competition and thus regard training in conflict management as a strategy to prevent an outbreak of violence.

10.4 Political economy of ethno-national claims-making

The Ethiopian government has rationalised ethnic federalism as a political project that accommodates ethno-linguistic diversity by generalising ‘the right to self-determination’ on all administrative scales (Turton 2006). As a result, many of the previously marginalised pastoral groups were for the first time ever recognised as ‘nations and nationalities’ within the Ethiopian polity, obtaining self-government at the regional, zonal and district levels. This process of ‘matching’ ethno-linguistic groups with administrative units proved highly conflictual. On the one hand, pastoralists’ reliance on mobil-

ity and flexible resource tenure in accordance with seasonal variations contradict the idea of permanent territorial occupation. On the other hand, ethnic federalism postulates a primordial concept of unchanging and bounded group identities, which does not take into account the historical flux, constructedness, and flexibility of group identities (Aalen 2006).

Pastoralists mostly interpreted ethnically defined administration as the exclusive rule by a dominant group within a given home territory. Demographically bigger and more powerful groups had much better chances of achieving this goal than smaller and minority clans. In the Somali regional state and elsewhere the right of self-determination to be enjoyed by ethnic groups was “taken as the rights of clans” (Asnake Kefale 2006, p 5). Historical animosities over grazing resources and water points were revived by administrative decentralisation as pastoralists sought to expand the boundaries of their *kebele* and district to claim sole possession of disputed localities. Changing the names of areas where strategic rangelands, water wells and settlements were concentrated in order to legitimise their incorporation into one’s home territory became another strategy of ethnic claims-making (Alemmaya Mulugeta 2008). Although important inter-ethnic tensions persisted through the 1990s, particularly at the boundary between the Oromiya, Afar and Somali regional states, prolonged confrontations mostly involved individual clan lineages and not entire ethnic groups. Since access to political representation depends on the ability to control administrative units, genealogical groups struggled to establish their own districts in order to ‘gain a better political position’ within their zone and their larger clan family (Ayele Gebre Mariam 2005).

A major incentive for pastoralists to identify with pre-defined ethnic collectivities and to adopt expansionist political tactics to the detriment of neighbouring groups was the extension of fiscal and administrative resources from regional capitals to districts. Particularly for the small educated elite who qualified for civil service, employment in a regional, zonal or district office became a lucrative source of income. Local and regional administrations provided important opportunities to appropriate petty cash in the form of both regular salaries and irregular funds. Concomitantly with the ‘trickling down’ of public resources into Ethiopia’s pastoral areas, neo-patrimonial relations between state representatives and pastoral groups expanded (Hagmann 2005). These networks, linking rural constituencies to urban gatekeepers, determined the allocation of state resources and assured the politicians popular support on election day.

10.5 Conclusion

In this article we have argued that contemporary conflicts in Ethiopia's lowland regions must be viewed within the context of the current state-building process in the semi-arid periphery, which strongly shapes the rationality of inter-group conflicts by both integrating and excluding pastoral communities. Although violence between herders and agro-pastoralists is perpetrated in 'non-state spheres' (Alemmaya Mulugeta 2008), it is directly related to the state, which mediates resource governance, peace-making and group identity. Administrative decentralisation has reconfigured pastoralists' relation to their territory, interactions between customary authorities and government officials, and relations between competing ethnic or clan groups. Since 1991 ethnic federalism has permitted local groups to establish and appropriate administrative and political spoils at local and regional levels. These processes are partly in continuity with previous interactions between the Ethiopian state and pastoral communities, which have shaped pastoralists' attitudes towards state institutions. In this sense, post-1991 decentralisation has accelerated a historically unfolding state-building process and its transformative impacts on pastoral life-worlds, politics and resource management.

As pastoral societies are incorporated into wider political and economic systems, the rationale of conflicts and violence is changing. Without completely losing its ritual and customary referents, collective violence in the pastoral areas is 'modernised' as its connections with modern state politics and capitalist modes of production intensify. The term 'pastoral conflict' seems increasingly inappropriate to grasp the current logics of violence, as it embodies a nostalgic connotation of herders and conflict. Contemporary disputes in the Ethiopian lowlands are sparked by competition over urban real estate, electoral campaigns or contested access to public budgets as much as by competition over wells and pastures. Consequently, there is a need to consider the changing logics of resource conflicts in the semi-arid parts of the Horn of Africa as the 'same' groups fight – from a historical perspective – over increasingly diversified natural, political and economic resources.

Endnotes

Full citation for this article:

Hagmann T, Alemmaya Mulugeta. 2010. Pastoral conflicts and state-building in the Ethiopian lowlands. *In*: Humi H, Wiesmann U, editors; with an international group of co-editors. *Global Change and Sustainable Development: A Synthesis of Regional Experiences from Research Partnerships*. Perspectives of the Swiss National Centre of Competence in Research (NCCR) North-South, University of Bern, Vol. 5. Bern, Switzerland: Geographica Bernensia, pp 163–173.

Acknowledgements:

The authors acknowledge support from the Swiss National Centre of Competence in Research (NCCR) North-South: Research Partnerships for Mitigating Syndromes of Global Change, co-funded by the Swiss National Science Foundation (SNSF), the Swiss Agency for Development and Cooperation (SDC), and the participating institutions.

¹ Tobias Hagmann is a lecturer at the Department of Geography of the University of Zurich. He holds a PhD in Public Administration and maintains a broad interest in development and conflict studies and politics in the Horn of Africa. His articles have appeared in *Conflict, Security and Development*, *Journal of International Development*, *Journal of Modern African Studies* and *Politique Africaine*.

E-mail: tobias.hagmann@geo.uzh.ch

² Alemmaya Mulugeta is a senior researcher based in Addis Abeba and affiliated with the NCCR North-South. She holds a PhD in social anthropology from the University of Basel in Switzerland, which she wrote on notions of conflict by Karrayu pastoralists in Ethiopia. Her articles have appeared in *Tsantsa* and *Africa Spectrum*.

E-mail: allemmaya_mu2000@yahoo.com

References

Publications elaborated within the framework of NCCR North-South research are indicated by an asterisk (*).

- Aalen L. 2006. Ethnic federalism and self-determination for nationalities in a semi-authoritarian state: The case of Ethiopia. *International Journal on Minority and Group Rights* 13(2–3):243–261.
- Abbink J. 1997. The shrinking cultural and political space of East African pastoral societies. *Nordic Journal of African Studies* 6(1):1–15.
- Abbink J. 2000. Violence and the crisis of conciliation: Suri, Dizi and the state in south-west Ethiopia. *Africa: Journal of the International African Institute* 70(4):527–550.
- Abdulahi M. 2005. *The Changing Nature of Pastoral Conflicts in South-eastern Ethiopia: The Case of the Boran and Digodi Pastoralists*. Nairobi, Kenya: Africa Peace Forum.
- Abdulahi M. 2007. The legal status of the communal land holding system in Ethiopia: The case of pastoral communities. *International Journal on Minority and Group Rights* 14(1):85–125.
- * Ahmed Ali Gedi. 2005. *Herder–Farmer Conflicts in the Dawa-Ganale River Basin Area: The Case of Intra-clan Conflict Among the Degodia Somali of Dollo Ado District in the Somali Regional State of Ethiopia*. WP 1 “Governance and Conflict Transformation”, Working Paper No. 1. Bern, Switzerland: Swiss National Centre of Competence in Research (NCCR) North-South. Also available at: http://www.nccr-north-south.unibe.ch/publications/Infosystem/On-line%20Dokumente/Upload/AAG_Herder-farmer-Conflicts.pdf; accessed on 5 January 2010.
- * Alemmaya Mulugeta. 2008. *The Transformation of Conflicts Among Ethiopian Pastoralists: Ethnography of the Notion of Conflict Among the Karrayu in the Upper and Middle Awash Valley* [PhD dissertation]. Basel, Switzerland: University of Basel.
- Asnake Kefale. 2006. *Ethiopian Federalism: Autonomy and Conflicts in the Somali Region*. Paper presented at a Workshop on Decentralisation, Federalism and Conflict, Oxford, UK, 5–7 October 2006. Available from Tobias Hagmann.
- Ayele Gebre Mariam. 2001. Conflict management, resolution and institutions among the Karrayu and their neighbours. In: Salih MAM, Dietz T, Ahmed AGM, editors. *African Pastoralism: Conflict, Institutions and Government*. London, UK: Pluto Press, pp 81–99.
- * Ayele Gebre Mariam. 2007. *The Critical Issue of Land Ownership: Violent Conflict Between the Abdalla Tomollogge and the Awlihan in Godey Zone, Somali Region, Ethiopia*. 2nd, revised edition [2005¹]. NCCR North-South Dialogue No. 11. Bern, Switzerland: Swiss National Centre of Competence in Research (NCCR) North-South. Also available at: <http://www.north-south.unibe.ch/content.php/page/id/230>; accessed on 5 January 2010.
- Bassi M. 2005. *Decisions in the Shade: Political and Juridical Processes Among the Oromo-Borena*. Trenton, NJ: Red Sea Press.
- Berhanu Nega, Berhanu Adenew, Samuel Gebre Selassie. 2003. Current land policy issues in Ethiopia. In: Groppo P, editor. *Land Reform, Land Settlement and Cooperatives*. Rome, Italy: Food and Agriculture Organisation (FAO), pp 103–124.
- Dereje Feyissa. 2003. *Ethnic Groups and Conflict: The Case of Anywaa–Nuer Relations in the Gambela Region, Western Ethiopia* [PhD dissertation]. Halle-Wittenberg, Germany: Martin Luther University.
- Farah AY. 1997. From traditional nomadic context to contemporary sedentization: Past relations between the Isaq and Gadabursi clans of Northern Somalia and south-east Ethiopia. In: Hogg R, editor. *Pastoralists, Ethnicity and the State in Ethiopia*. London, UK: HAAN, pp 81–104.
- FDRE [Federal Democratic Republic of Ethiopia]. 1995. *Constitution of the Federal Democratic Republic of Ethiopia*. Addis Abeba, Ethiopia: Federal Negarit Gazeta.
- Getachew Kassa. 2001a. Resource conflicts among the Afar of north-east Ethiopia. In: Salih MAM, Dietz T, Ahmed AGM, editors. *African Pastoralism: Conflict, Institutions and Government*. London, UK: Pluto Press, pp 145–171.

- Getachew Kassa. 2001b. *Among the Pastoral Afar in Ethiopia: Tradition, Continuity and Socio-economic Change*. Utrecht, the Netherlands: International Book.
- * Hagmann T. 2005. Beyond clannishness and colonialism: Understanding political disorder in Ethiopia's Somali region, 1991–2004. *Journal of Modern African Studies* 43(4):509–536.
- * Hagmann T. 2006. *Pastoral Conflict and Resource Management in Ethiopia's Somali Region* [PhD dissertation]. Lausanne, Switzerland: Swiss Graduate School of Public Administration (IDHEAP), University of Lausanne.
- * Hagmann T. 2007. Bringing the sultan back in: Elders as peacemakers in Ethiopia's Somali region. In: Buur L, Kyed HM, editors. *State Recognition and Democratisation in Sub-Saharan Africa: A New Dawn for Traditional Authorities?* New York, NY: Palgrave, pp 31–51.
- Helland J. 2000. Institutional erosion in the drylands: The case of the Borana pastoralists. In: Manger L, Ahmed AGM, editors. *Pastoralists and Environment: Experiences from the Greater Horn of Africa*. Addis Abeba, Ethiopia: Organisation for Social Science Research in Eastern and Southern Africa (OSSREA), pp 19–49.
- Kelemework Tafere. 2006. *Indigenous Institutions of Conflict Resolution among the Ab'ala Afar of North-eastern Ethiopia*. Addis Abeba, Ethiopia: Addis Abeba University.
- Lister S. 2004. *The Processes and Dynamics of Pastoralist Representation in Ethiopia*. Brighton, UK: Institute of Development Studies (IDS).
- Markakis J. 1994. Ethnic conflict and the state in the Horn of Africa. In: Fukui K, Markakis J, editors. *Ethnicity and Conflict in the Horn of Africa*. London, UK: James Currey, pp 217–237.
- Markakis J. 2003. Anatomy of a conflict: Afar & Ise Ethiopia. *Review of African Political Economy* 30(97):445–453.
- Nori M, Switzer J, Crawford A. 2005. *Herding on the Brink: Towards a Global Survey of Pastoral Communities and Conflict*. London, UK: International Institute for Environment and Development (IIED).
- Said A. 1997. Resource use conflicts in the Middle Awash Valley of Ethiopia: The crisis of Afar pastoralism. In: Hogg R, editor. *Pastoralists, Ethnicity and the State in Ethiopia*. London, UK: HAAN, pp 123–141.
- Sandford S, Yohannes Habtu. 2000. *Emergency Response Interventions in Pastoral Areas of Ethiopia*. London, UK: Department for International Development (DFID).
- Schlee G. 2003. Redrawing the map of the Horn: The politics of difference. *Africa: Journal of the International African Institute* 73(3):343–368.
- Sugule J, Walker R. 1998. *Changing Pastoralism in the Ethiopian Somali National Regional State (Region 5)*. Addis Abeba, Ethiopia: United Nations Emergencies Unit for Ethiopia.
- Tache B, Irwin B. 2003. *Traditional Institutions, Multiple Stakeholders and Modern Perspectives in Common Property*. London, UK: International Institute for Environment and Development (IIED).
- Taffesse Mesfin. 2000. *An Overview and Analysis of the History of Public Policy towards the Development of Pastoralism in Ethiopia*. Paper presented at the National Conference on Pastoral Development in Ethiopia. Addis Abeba, Ethiopia, 2 February 2000.
- Turton D. 2006. *Ethnic Federalism: The Ethiopian Experience in Comparative Perspective*. Oxford, UK: James Currey.
- Unruh J. 2005. Changing conflict resolution institutions in the Ethiopian pastoral commons: The role of armed confrontation in rule-making. *GeoJournal* 64(3):225–237.
- Yacob Arsano. 2000. *Pastoralism in Ethiopia: The Issues of Viability*. Paper presented at the National Conference on Pastoral Development in Ethiopia, Addis Abeba, Ethiopia, 2 February 2000. Available from Tobias Hagmann.

11 Research on Water Management and Conflict Transformation in the Eastern Nile Basin Region

Samuel Luzi¹, Yacob Arsano², Simon Mason³, and Moges Shiferaw⁴

Abstract

The challenges of water resources management and the mitigation of water allocation conflicts have gained increasing attention among policy makers and researchers as population growth and changing consumption patterns intensify the competition for limited freshwater resources. This article synthesises four studies of 'water conflicts' in the Horn of Africa, three of which investigated the issue of transboundary river management in the Nile Basin, while the fourth addressed the role of irrigation water property rights at community level. At both levels, disputes over the utilisation of water resources are not primarily a function of overall scarcity or abundance of water, but rather of users' access to water resources and related services. Access is influenced by policies and institutions. The mitigation of 'water conflicts' depends, among other things, on reform of domestic water policies and water sector institutions, and on enforcement of clearly defined property rights.

Keywords: Transboundary river management; irrigation water property rights; water conflict; conflict transformation; Nile Basin; Ethiopia.

11.1 Water-management challenges and inter-group conflicts

Although rainfall patterns and corresponding conditions of ‘water scarcity’ vary in time and space, population growth is causing a steady increase in the number of countries facing ‘physical water scarcity’ (i.e. limited water availability per capita at national scale). Land-use changes alter the water retention capacity of the soil and vegetation and affect river runoff patterns. Hydraulic infrastructure and policies governing the allocation and utilisation of water also influence access to water for different uses in a given river basin. Budgetary constraints force water authorities to evaluate trade-offs between strategies to enhance infrastructural capacity for flow regulation, increase water use efficiency, and ensure long-term environmental conservation, respectively.

Modifications in runoff patterns and/or water quality can entail externalities in downstream locations separated by political or administrative boundaries. Fragmentation of watersheds affects the decision-making processes and the behaviour of riparian stakeholders at both the local and the basin scale. The present contribution focuses on conflicts between stakeholder groups over the allocation and utilisation of scarce water that can arise in this context.

11.2 Four studies on ‘water conflict and cooperation’ in the Nile Basin

The ‘water conflicts’ studied in the Horn of Africa within the framework of the Swiss National Centre of Competence in Research (NCCR) North-South programme primarily concern quantity allocation and flow regulation. The irrigation sub-sector, as the major consumer of river water, was of particular interest in these studies. Two specific fields of research were addressed: 1) transboundary conflict and cooperation in the Eastern Nile Basin, and 2) the role of property rights with respect to irrigation water at local scale (Figure 1). Three PhD studies focusing on regional hydro-politics in the Nile Basin (Mason 2004; Yacob Arsano 2004; Luzi 2007) were closely aligned in terms of research questions and methodology. They drew on conceptual approaches from political science and from conflict studies, and methods used included stakeholder interviews, policy analysis and network analysis. A PhD study on property rights and irrigation water management (Moges



Fig. 1
Geographical foci of studies on water management and conflict transformation carried out in the Horn of Africa within the framework of the Swiss National Centre of Competence in Research (NCCR) North-South programme. (Map by Marco Zanoli and Samuel Luzi, 2008)

Shiferaw 2007) applied an econometric framework to assess the correlation between characteristics of property rights regimes and the efficiency of water use across different case study areas.

The overall analytical approach adopted in these studies on water management and conflict transformation in the Horn of Africa was based on two key elements: 1) a focus on complex *patterns of interrelations* between resources, resource users and the institutions influencing users' behaviour – as opposed to unidirectional relationships linking 'causes' to the occurrence of (violent) conflict – and 2) a focus on factors and specific interventions that can foster the *mitigation* of 'water conflicts'.

Based on the results of these studies, this article highlights three aspects that link water management conflicts at the local and international scales, namely the question of access vs. physical scarcity, the specific role of actors and institutions, and particular strategies for mitigating conflicts over water allocation and utilisation.

11.2.1 Hydro-politics in the Nile Basin

The Horn of Africa and the lower Nile Basin are among the most water-scarce regions in the world. Egypt was first in the race to transform the Nile's flow into productive use, and consolidated its control of the river both by constructing a dam on its own territory and by signing international treaties that are considered unfair by upstream states. The 1990s saw an intensification of efforts to manage the shared river in a cooperative manner, despite intra- and international tensions that continue to threaten stability and development in the region.

The 'Nile Basin' studies conducted by NCCR North-South researchers in the Horn of Africa contribute to the broader discourse on conflict and cooperation in transboundary river basins (Toset et al 2000; Yoffe et al 2003; Luzi 2006). The conceptual frameworks adopted in the three studies advance understanding of the Nile conflict along different dimensions. First, they make an explicit distinction between riparian *positions* (ideology-based claims), *interests* (written or unwritten water development targets and underlying economic and political rationales) and *needs* (ultimate goals of water resources development, i.e. food security, economic welfare). Second, they integrate different perspectives on transboundary cooperation (i.e. 'security', 'legal/institutional', 'socio-economic' and 'environmental') and take account of the cultural and historical significance of the shared river. Third, they analyse the interface between domestic and transboundary decision-making processes and the institutions of water governance through the lens of a 'two-level game'.

The studies generally challenge two assumptions that are often applied in the analysis of transboundary river conflicts and are held by certain actors involved in the hydro-politics of the Nile Basin: 1) allocation of water in the Nile Basin is a 'zero-sum game', with gains for one country necessarily coming at the expense of other riparian states, and 2) riparian states act as unitary actors; the positions adopted by their leaders and negotiators correspond to a unitary 'national interest'. Refined conceptual frameworks are

applied with regard to complex hydrological and socio-economic implications of different river management scenarios and the motivations behind the behaviour of basin states. The results can be summarised as follows:

- The conflict in the Nile Basin is driven mainly by ideological claims (for ‘equitable allocation’, ‘prior use rights’ or ‘national sovereignty’) and by claims to higher water shares to meet national irrigation expansion targets. All Nile countries set targets for development of water resources unilaterally, irrespective of the supply and demand situation in other riparian countries. The mythical significance of the Nile as a common heritage and a uniting factor at the basin level is under-valued.
- Incompatible negotiating *positions* are manifestations of more compatible *interests* and *needs* (i.e. water security for Egypt, economic development for upstream states). Transboundary cooperation is more likely if negotiators focus on these needs rather than on positions. The potential to improve the efficiency of water use is still substantial in both downstream and upstream states. Many water management options exist in upstream regions that have no major negative effects on downstream water uses, e.g. watershed management, flood control, and hydropower production.
- Both the claims for a greater share of the Nile and the interest of riparian countries in specific collaborative river development projects have important underpinnings in policy processes within the basin states. National negotiators’ ability to make concessions in the transboundary negotiations is constrained by the interests of domestic actors and the institutions determining their influence in decision-making processes. For example, the inability of national water ministries to implement demand-management strategies (water pricing, shifts in cropping patterns, etc.) contrary to the interests of certain domestic stakeholders is an obstacle to transboundary cooperation, as it results in even more inflexible national claims for more water (Luzi et al 2008). Trade-offs between domestic and basin-wide water development strategies must be addressed comprehensively, which necessitates better integration of national and sectoral policies, more stakeholder participation, and greater commitment by political leaders to advancing the transboundary negotiation process.
- In the absence of confidence-building measures and tangible benefits from cooperation, a rapid convergence of ideologically motivated claims for higher national water quotas is unlikely. Initiatives to mitigate conflicts in

shared river basins should aim to foster multi-track communication, target 'win-win' packages, exploit comparative advantages, pursue tighter economic integration, and employ well-balanced third party mediation and financial incentives. A broad range of joint efforts should be considered, including the adoption of a shared vision and the creation of a 'community of interests' drawing among other things on spiritual, cultural and cross-border community interactions, exchange of students, and intensified trade relations.

All three authors hold a differentiated view as to the impact of the donor-supported Nile Basin Initiative (NBI). While progress made in terms of broadening the scope of transboundary interactions is remarkable, several key challenges have been only partially addressed. Mistrust and unilateralism are still common, the momentum for domestic policy reform generated by the transboundary process has been limited, joint investment projects are progressing slowly, and a shared vision of long-term regional development remains vague.

The focus on mitigation in NCCR North-South research on the Nile Basin is illustrated by a series of problem-solving dialogue workshops organised by the researchers involved (2002–2004), which aimed to foster exchange of ideas among key water sector representatives from Egypt, Ethiopia and the Sudan (see Amer et al 2005; Mason 2005). A training workshop for 30 young water professionals from the same countries was organised in 2006.

11.2.2 Irrigation water management and property rights

Despite the importance and potential scarcity of water, this common pool resource is often utilised inefficiently and maintained poorly (Ostrom and Gardner 1993). Moges Shiferaw's study (2007) is concerned with the inefficiencies and conflicts related to the allocation and utilisation of irrigation water at the local level, i.e. between farmers or communities relying on the same source of water. This study applies an innovative conceptual framework to assess the characteristics and impacts of different water property rights regimes. It refines the commonly applied typology of property rights regimes (Ostrom 2000) by distinguishing specific combinations of 'bundles' and related 'qualities' of rights. The following results were obtained:

- The efficiency of agricultural production in the case study areas is not necessarily a function of the physical availability of water, but rather of farmers' access to water and the security of water entitlements.

- Ethiopia has an untapped potential to increase irrigated production. Productive efficiency and water use efficiency among small-scale producers can be increased by improving the structure of irrigation water rights, i.e. without increasing the volume of water. The policies governing irrigation water rights in Ethiopia have failed to capture essential elements of ‘ideal’ property rights regimes – e.g. regarding the security and tradability of rights – and have resulted in substantial resource degradation and social conflict.
- An ideal water property rights regime increases both the incentive to invest in irrigation systems and the incentive to use water for its most valuable purpose. Equitable distribution of essential bundles of regulatory rights among irrigators (e.g. the right to sell entitlements) significantly enhances the level of multilateral bargaining over ‘the rules of the game’, which in turn fosters the establishment of optimal governance systems. If the initial allocation of rights can be defined correctly, e.g. by the government, the desired outcome of high water use efficiency can be achieved by the right-holders themselves without substantial government intervention.

The findings of this study have influenced water policy reform processes at national and regional levels in Ethiopia. The issue of property rights is politically sensitive, however, and the success of property rights reforms depends on general political reforms and the capacity of the government to assign and enforce initial rights.

11.3 Synthesis: water resources, actors, institutions and interventions

This section attempts a synthesis of the findings of the NCCR North-South studies on ‘water conflicts’ in the Horn of Africa. The focus is on 1) the linkages between ‘water scarcity’ and riparian conflicts, 2) the actors and institutions involved, and 3) conflict mitigation approaches.

11.3.1 The status of resources: water scarcity and conflict

The insights provided by the NCCR North-South studies on water management and conflicts in the Horn of Africa support the criticism of Malthusian narratives that directly link water scarcity to (violent) conflict (see also Ohlsson 2000). ‘Water scarcity’ is a function of water supply and demand,

and both these parameters depend on technological and institutional capacities in a given watershed. For users, supply is defined primarily by their *access* to water of good quality, regardless of overall water scarcity or abundance. With respect to the multiple factors influencing water availability at the user level, different types of ‘water scarcity’ can be defined, e.g. physical, economic, managerial, institutional or political water scarcity (Molle and Mollinga 2003).

In both the Nile Basin and the case study areas in Amhara Regional State, the total availability of water is sufficient to satisfy current demand. At both levels, however, water is used inefficiently, and the entitlements of water users (i.e. basin states or individual farmers/communities, respectively) to a share of the water are ill defined. High uncertainty and the threat of water scarcity for downstream water users fuel persistent conflicts between farmers, neighbouring communities and riparian states over *de jure* and *de facto* access to water. Tensions between riparian stakeholders can prevent the establishment of more efficient water-management regimes, even if no violent conflict erupts.

Water conflict studies need to distinguish clearly between physical water scarcity and lack of access to water. Recognition of water conflicts as disputes over ‘access’ also broadens the range of possible mitigation strategies.

11.3.2 Actors, their motivations, and the institutions governing their behaviour

The main parties in conflicts over the utilisation of water considered here are riparian states at basin level, and farmers or farmer communities at local level. Claims for a greater share of water (i.e. the conflicting parties’ *positions*) often relate to inadequate access to timely water for different productive uses (i.e. their *interests*). Underlying *needs* relate to issues of household food security and livelihoods (local level), or national development indicators such as food security, economic growth, and rural employment (basin level). At both levels, interests and needs can be satisfied at least partly without increasing the overall availability of water, i.e. by increasing irrigation efficiency and by diversifying income opportunities. The persistent focus on increased water supply often overshadows the need for reformed policies on the *utilisation* of water.

The behaviour of conflicting parties vis-à-vis each other, as well as intra-group decision-making processes also depend on the institutions in place.

At local level, the institutional setting is defined, among other things, by the property rights regime and the ability of the authorities to enforce regulations. The institutions governing transboundary relations (international law, Nile Basin Initiative) are weak and only peripherally govern the behaviour of the riparian states.

National water authorities are key players in the context of both reform of property rights systems at local level and basin-wide harmonisation of water policies. However, their ability to reform water-management systems and mitigate 'water conflicts' is limited, as they are faced with various constraints such as limited influence on the formulation of overall national development targets, inadequate inter-sectoral coordination, and limited planning and implementation capacities.

11.3.3 Water conflict mitigation

The studies summarised here agree that negotiations and dialogue between the conflicting parties support the transformation of riparian conflicts into mutually beneficial arrangements, potentially resulting in greater efficiency of water use. Such interactions, however, need to take place on a level playing field. The allocation of clearly defined water use rights – at both basin and local levels – can at least partly provide the security that encourages water users to engage in the joint design of more efficient systems of water resources development and management.

A major difference between the local and international levels exists with regard to the appropriate mechanism for allocating water use rights. The reform of irrigation property rights systems at local level depends on the ability of a higher-level authority (i.e. the state) to define an initial allocation of rights and to enforce a corresponding legal framework. Dialogue alone is not an efficient strategy to resolve water allocation disputes between individual farmers and between neighbouring communities. In contrast, no supra-national institution exists at the basin level with the authority to establish and enforce a basin-wide quota allocation system. Water sharing arrangements need to be defined through bi- or multilateral negotiations between the riparian states. Improved water use efficiency in this case is not primarily one of the key *outcomes* of a reformed water allocation system (as in the case of clearly defined irrigation water rights at local level), but must rather be a key element in the *design* of cooperative strategies in order to reduce national water demands and temper claims for increased national water shares.

In this sense, the mitigation of conflicts between irrigators through the reform of irrigation water property rights regimes can be an important component of efforts to use water more efficiently at national level, and thus to mitigate transboundary disputes. In turn, the establishment of a transboundary regime for joint river management can generate momentum and mobilise resources to address questions of irrigation efficiency and property rights regimes at the domestic level (see also Mason et al 2009).

11.4 Conclusions

The studies on water management and conflict transformation in the Horn of Africa conducted within the framework of the NCCR North-South provide insights into the linkages between water management and conflicts at different levels. The explicit analytical focus on patterns of interrelations between resources, actors and institutions helped researchers to address the complexity of cooperative water management and to evaluate conflict mitigation strategies. The studies show that a focus on institutions, understood as property rights regimes and governance structures, is essential both in the analysis of water utilisation conflicts and in efforts to mitigate such conflicts.

Endnotes

Full citation for this article:

Luzi S, Yacob Arsano, Mason S, Moges Shiferaw. 2010. Research on water management and conflict transformation in the Eastern Nile Basin region. *In: Humi H, Wiesmann U, editors; with an international group of co-editors. Global Change and Sustainable Development: A Synthesis of Regional Experiences from Research Partnerships*. Perspectives of the Swiss National Centre of Competence in Research (NCCR) North-South, University of Bern, Vol. 5. Bern, Switzerland: Geographica Bernensia, pp 175–186.

Acknowledgements:

The authors acknowledge support from the Swiss National Centre of Competence in Research (NCCR) North-South: Research Partnerships for Mitigating Syndromes of Global Change, co-funded by the Swiss National Science Foundation (SNSF), the Swiss Agency for Development and Cooperation (SDC), and the participating institutions.

¹ Samuel Luzi (PhD in Environmental Sciences) is a project officer at the Swiss Federal Institute of Aquatic Science and Technology, Department of Water and Sanitation in Developing Countries (Eawag/Sandec). His research interests include point-of-use water treatment, transboundary river management, and water policy processes.

E-mail: samuel.luzi@eawag.ch

² Yacob Arsano (PhD in Political Sciences) is Professor of Political Science and International Relations at Addis Abeba University, Ethiopia. He has widely published in the fields of Hydropolitics and Comparative Politics. Currently he is Dean of the College of Social Sciences at Addis Abeba University and Chairman of the Regional Scientific Advisory Board of the Swiss National Centre of Competence in Research (NCCR) North-South in its Joint Area of Case Studies (JACS) Horn of Africa (HOA).

E-mail: yarsano@ethionet.et

³ Simon Mason (PhD in Environmental Sciences) is a project leader in the Mediation Support Project at the Center for Security Studies, Swiss Federal Institute of Technology (ETH) in Zurich. His research interests include mediation experiences in different intra- and international conflicts, the use of mediation in conflicts with religious dimensions, and water conflicts and cooperation. He has been involved in the organisation of various workshops and trainings in the field of mediation.

E-mail: mason@sipo.gess.ethz.ch

⁴ Moges Shiferaw holds a BSc in Agricultural Economics from Alemmaya University of Agriculture, and an MSc in Economic Policy Analysis from Addis Abeba University. He holds a PhD degree from the University of Basel. He is active in several professional networks and NGOs in Ethiopia and is Director of Flexi Studies at Yardtack International College of Distance and Open Learning.

E-mail: mogeshiferaw2002@yahoo.com

References

Publications elaborated within the framework of NCCR North-South research are indicated by an asterisk (*).

- * Amer SED, Yacob Arsano, Battahani AE, Hamad OET, Hefny MAEM, Imeru Tamrat. 2005. Sustainable development and international cooperation in the Eastern Nile Basin. *Aquatic Sciences* 67(1):3–14.
- * Luzi S. 2006. Les Bassins hydrographiques internationaux: conflits et gestion des ressources hydriques. *Les Cahiers de la Sécurité* 63:35–59.
- * Luzi S. 2007. *Double-edged Hydropolitics on the Nile* [PhD dissertation]. Zurich, Switzerland: Swiss Federal Institute of Technology Zurich (ETHZ).
- * Luzi S, Hamouda MA, Sigrist F, Tauchnitz E. 2008. Water policy networks in Egypt and Ethiopia. *The Journal of Environment and Development* 17(3):238–268.
- * Mason SA. 2004. *From Conflict to Cooperation in the Nile Basin* [PhD dissertation]. Zurich, Switzerland: Swiss Federal Institute of Technology Zurich (ETHZ). Also available at: <http://www.north-south.unibe.ch/content.php/filterpage/id/27>; accessed on 27 October 2009.
- * Mason SA. 2005. Are we scorpions? The role of upstream–downstream dialogue in fostering cooperation in the Nile Basin. *Mountain Research and Development* 25(2):115–120.
- * Mason SA, Hagmann T, Bichsel C, Ludi E, Yacob Arsano. 2009. Linkages between sub-national and international water conflicts: The Eastern Nile Basin. In: Brauch HG, Oswald Spring U, Grin J, Mesiasz C, Kameri-Mbote P, Behera NC, Chourou B, Krumpal H, editors. *Facing Global Environmental Change: Environmental, Human, Energy, Food, Health and Water Security Concepts*. Hexagon Series on Human and Environmental Security and Peace, Vol. 4. Berlin, Germany: Springer-Verlag, pp 325–334.
- * Moges Shiferaw. 2007. *The Economics of Shared Irrigation Water Rights* [PhD dissertation]. Basel, Switzerland: University of Basel.
- Molle F, Mollinga P. 2003. Water poverty indicators: Conceptual problems and policy issues. *Water Policy* 5(5):529–544.
- Ohlsson L. 2000. Water conflicts and social resource scarcity. *Physics and Chemistry of the Earth, Part B: Hydrology, Oceans and Atmosphere* 25(3):213–220.
- Ostrom E. 2000. Private and common property rights. In: Bouckaert B, De Geest G, editors. *Encyclopedia of Law and Economics, Vol. 2: Civil Law and Economics*. Cheltenham, UK: Edward Elgar, pp 332–379.
- Ostrom E, Gardner R. 1993. Coping with asymmetries in the commons: Self-governing irrigation systems can work. *Journal of Economic Perspectives* 7(4):93–112.
- Toset HPW, Gleditsch NP, Hegre H. 2000. Shared rivers and interstate conflict. *Political Geography* 19(8):971–996.
- * Yacob Arsano. 2004. *Ethiopia and the Nile: Dilemmas of National and Regional Hydropolitics* [PhD dissertation]. Zurich, Switzerland: University of Zurich. Also available at: <http://www.north-south.unibe.ch/content.php/filterpage/id/27>; accessed on 27 October 2009.
- Yoffe S, Wolf AT, Giordano M. 2003. Conflict and cooperation over international freshwater resources: Indicators of basins at risk. *Journal of The American Water Resources Association* 39(5):1109–1126.

12 Land Degradation and Sustainable Land Management in the Highlands of Ethiopia

Hans Hurni¹, Solomon Abate², Amare Bantider³, Berhanu Debele⁴, Eva Ludi⁵, Brigitte Portner⁶, Birru Yitaferu⁷, and Gete Zeleke⁸

Abstract

The Ethiopian Highlands cover over 50% of the country and are home to more than 90% of Ethiopia's population of over 80 million people (estimate for 2010); 60% of the livestock and 90% of the area suited for agriculture are also located here. Although more than 90% of the Highlands was once forested, today a mere 20% of this area is covered by trees, and the percentage of forest cover is less than 4%. This is evidence of a high incidence of degradation of vegetation in the past, which has continued to the present. Land-use and land-cover changes have been particularly dynamic in the 20th century, during which climate change also began to have effects; wildlife in natural habitats have been restricted to those few areas that were preserved naturally due to rugged topography or natural aridity. Soil erosion has been severe throughout the Highlands, but mainly on agricultural land; the current severity and extent of soil degradation seriously threaten food security. In response, a number of soil and water conservation measures have been successfully implemented over the past 35 years in some parts of the Highlands. This is highly encouraging, but greater emphasis must be given to conservation in the coming decades.

Keywords: Ethiopian Highlands; research partnership; land degradation; land-cover change; sustainable land management; soil and water conservation; protected area management.

12.1 Introduction

12.1.1 The Ethiopian Highlands

The Ethiopian Highlands are defined here as an area extending from about 1000 metres above sea level up to the highest peak in Ethiopia, at 4533 m. In this zone there are normally sufficient rainfall and suitable temperatures for rainfed agriculture. Due to temperature constraints, the upper limit of cropping lies at about 3800 m, while the lower limit is defined by dryness, which makes rainfed cultivation impossible in areas below about 800 m on the western side of the Highlands, and below 1200 m on the eastern side. Given these boundaries, favourable agro-climatic conditions prevail over an area of 570,000 km², or 52% of the country (Hurni 1998). Human-induced climate change has been impacting agro-ecological belts since about the 1970s, a fact that is evident not only in terms of rainfall variability but particularly in terms of observed temperature increases (Hurni 2005). This has considerable implications for the suitability of agricultural cropping patterns for crops such as coffee (Rüegsegger 2008).

In 2007 about 84% of the Ethiopian population, or about 64 million out of about 77 million persons, lived in a rural environment (extrapolated from CSA 2006), mostly in the Highlands; at the same time, the Highlands are also where most of the urban population lived. The rural population has grown from approximately 12 million people around 1900 to approximately 64 million in 2007 (Hurni et al, in preparation), while the urban population increased from nearly 0 to about 13 million in the same period. Farm sizes today are less than one hectare per household on average; the livestock population, while considerable and exceeding the capacity of grazing land, is still insufficient to provide enough labour to plough the land. Farm productivity is at a minimal grain output between 0.3 and 1.5 tonnes per hectare, and land degradation due to agricultural practices is widespread, amounting to an average of over 40 tonnes of soil lost per hectare of cropland every year (Hurni 1993).

Sustainable management of natural resources, particularly soil and water, is of utmost importance to Ethiopian agriculture. Since the inception of agriculture several millennia ago, little has been done by peasants and societies to conserve natural resources, as land was abundant. The Highlands were deforested for agriculture, a process that was intensified especially in the past century when the population started to grow exponentially. Conservation

measures on agricultural land were applied in very few instances only, and had to be introduced on a broader scale by the government and by foreign programmes in the aftermath of the great famine of 1972–1973, which was drought-induced but caused by a lack of political response.

12.1.2 Key issues in land degradation and sustainable land management

According to the Millennium Ecosystem Assessment (MA 2005) the term ‘land’ includes renewable natural resources, i.e. soils, water, vegetation and wildlife, in their terrestrial ecosystems. Land degradation, in turn, includes all processes that diminish the capacity of land resources to perform essential functions and services in these ecosystems, i.e. deforestation, loss of biodiversity, soil degradation and disturbance of water cycles. Sustainable land management consists of technical and institutional measures initiated by individuals or societies to maintain land productivity and other functions of land resources for present and future generations.

There have been numerous and controversial debates about explaining land degradation processes in Ethiopia and seeking mitigation options. They have focused on:

1. Approaches applied to implement land rehabilitation activities, e.g. incentive-based approaches (Webb and Kumar 1995; Holden et al 2006); (in)voluntary campaigns; multi-level stakeholder and participatory approaches (Hurni and Ludi 2000); and top-down approaches versus bottom-up and community-based approaches (Alemneh Dejene et al 2003);
2. Priorities and agenda-setting involving land rehabilitation work as well as the general rural development activities and policies of the country (Keeley and Scoones 2000, 2003; Nyssen et al 2004a);
3. Identifying the root causes of land degradation that have an impact on decision-making, e.g. traditional agricultural practices (Hurni 1990), land tenure insecurity (Yeraswork Admassu 1995; Dessalegn Rahmato 2001, 2004) and pressure from accelerated population growth (EHRS 1986).

Considerable efforts have been made to establish monitoring and research throughout the Ethiopian Highlands, particularly at the level of small watersheds, but generalisations about the processes of land use and land degrada-

tion, as well as conservation approaches as a whole, have yet to be developed from the case study sites. This requires debates among scientists from different disciplines and other stakeholders at large.

12.1.3 Research partnership approaches

Research on processes of land-use change, land degradation and sustainable land management was initiated in the Ethiopian Highlands by the Soil Conservation Research Programme (SCRCP) in 1981 in conjunction with the country-wide soil conservation campaign (Hurni 1982; SCRCP 2000). Prior to this initiative, only a limited number of studies existed. In 2001, the Swiss National Centre of Competence in Research (NCCR) North-South chose the Ethiopian Highlands as one of its syndrome contexts (Yacob Arsano et al 2004) and initiated a number of PhD and Master's studies on this region, taking a transdisciplinary approach to identify research topics, involving scholars from different disciplines as well as development specialists. The results of these studies constitute the main base of information used here, though emphasis is also given to studies done outside the NCCR North-South programme.

12.2 Status and dynamics of land cover, land use and land degradation

12.2.1 Deforestation and forest dynamics

Most areas in Ethiopia that currently have more than 3% tree cover are assumed to have been forested about 5000 years ago, before deforestation for agriculture began (Hurni 1987; Darbyshire et al 2003; Nyssen et al 2004b). The north-central Highlands were a focus of agricultural development over the past 2–3 millennia, according to historical records (Bard et al 2000) and carbon dating (Hurni 1987); this was also where most deforestation occurred as early as many centuries ago (Ritler 2001). Today these areas have 3–19% tree cover (Figure 1). By contrast, in the present-day 19–40% tree cover zone, which is found primarily in the western and southern Highlands, heavy deforestation has taken place particularly since the 1950s (Solomon Abate 1994; Gete Zeleke 2000).

Deforestation was always followed by a change in land use and land cover, from forest to grassland and cropland. A particular increase in cropland was observed in the second half of the 20th century, largely at the expense of grassland and forestland – a fact that is widely acknowledged in the scien-

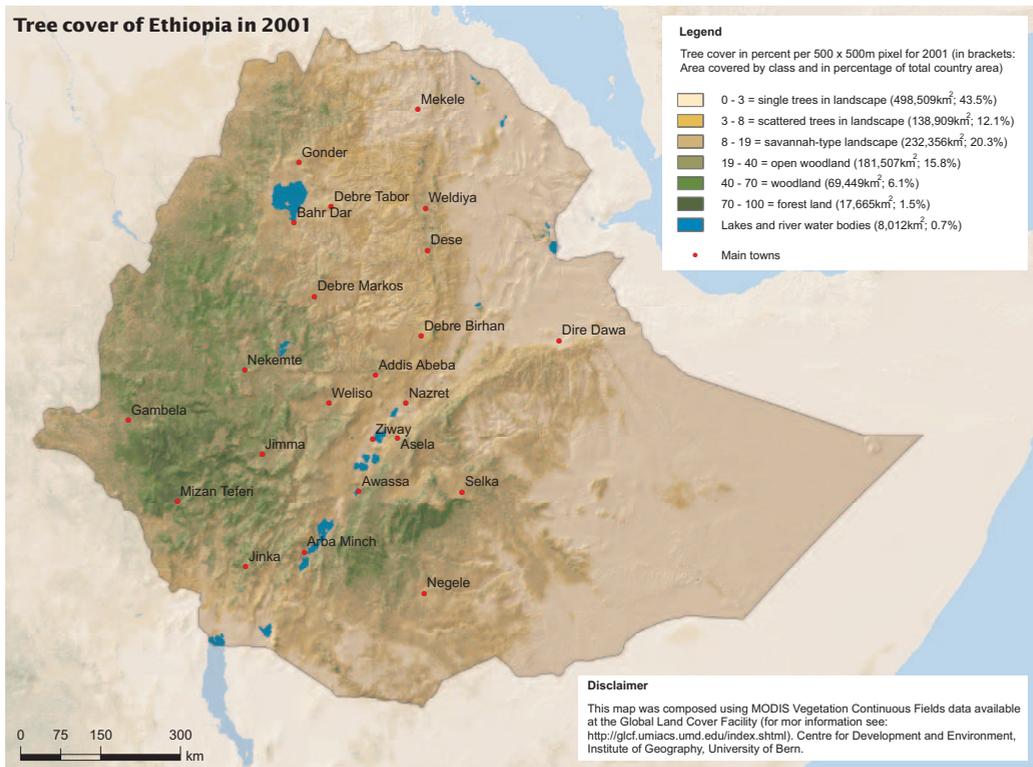


Fig. 1
Tree and forest cover in Ethiopia in 2001 as modified by agricultural activities during about 5000 years. (Map composed by Kaspar Hurni; to be published in Hurni et al, in preparation)

tific literature. During specific periods throughout history entire landscapes were abandoned for a variety of reasons, such as famines, pests or political turmoil, causing the land to regenerate and develop secondary bush and tree vegetation, which was later again slashed and burnt for recultivation; at present, however, this hardly occurs any more.

12.2.2 Land-use and land-cover changes

Within the NCCR North-South programme, Birru Yitaferu (2007), Schild (2006), Amare Bantider (2007), Hurni (2005) and Solomon Abebe (2005) studied land-use and land-cover changes as well as their underlying causes. All studies revealed highly dynamic systems, but changes observed among the various land-cover types were not all similar, mainly due to different initial situations. In the recent past, more intense loss of forest cover and expansion of cultivation land coincided with changes in land policies and institutions in the 1970s, 1990s and early 2000s (Amare Bantider 2007).

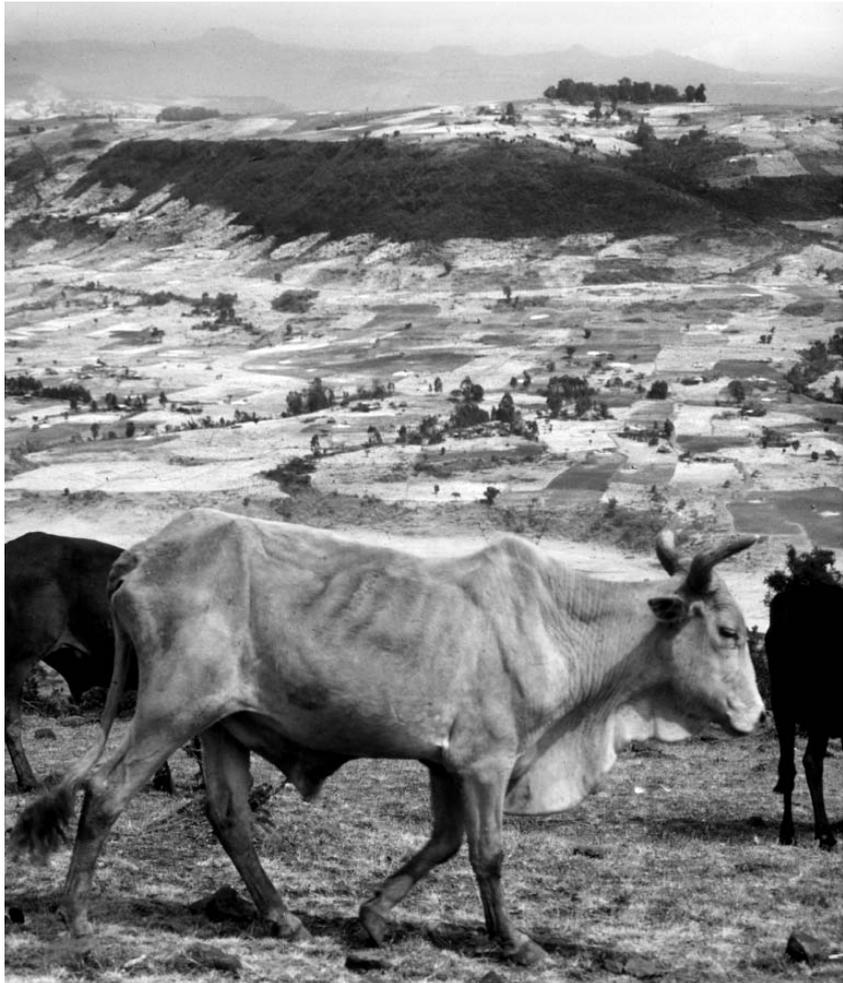


Fig. 2
Intensive land-
cover and land-use
changes around
the Anjeni Soil
Conservation
Research Pro-
gramme (SCR)
Research Site in
Gojam mainly
occurred between
1950 and 1980
according to Gete
Zeleeke (2000).
(Photo by Hans
Hurni, 1984)

During the 20th century the highest deforestation rates were found in areas where the forest cover was still between 8% and 40% (Figure 2). Periods of active deforestation occurred during phases of rapid population growth and were coupled with little institutional concern about, or insufficient enforcement of, measures to combat environmental degradation. On the other hand, reduced deforestation and even reforestation were accompanied by increased government support and international assistance, as in the 1980s, but also during the past decade since 2000, when increased government awareness and more conducive approaches were observed, particularly in the Tigray region in the north (Nyssen et al 2009).

12.2.3 Wildlife dynamics

The Ethiopian Highlands today are characterised by an extreme sparseness of natural habitats where wildlife could have survived during the extended period of agricultural use over the past 5000 years. Hence current wildlife is limited to animals that are less dependent on natural habitats, such as predators or birds, while ruminants, which depend on distinct habitats, have been reduced to very low numbers or few areas, and in some cases even became extinct long ago. Only a few wildlife habitats have been preserved in their natural form, such as high mountaintops above about 4000 m, steep escarpments on the borders of the Highlands, and semi-arid areas in the lower parts. Well-known places in the Highlands with natural wildlife habitats include the Simen Mountains in the north and the Bale Mountains in the south, both of which have been designated as national parks. Research within the NCCR North-South focused on the Simen Mountains (Grünenfelder 2005; Hurni 2005; Bircher 2006; Schild 2006; Ludi 2007), where some wildlife remained in natural habitats that are unsuitable for cropping due to steep topography, high altitude, or both.

12.2.4 Soil degradation due to water erosion

In Ethiopia agricultural land is tilled using an ox-plough system; this exposes the soil to rain, particularly during the onset of the rainy season. The process of soil erosion is a consequence of rainfed farming on steep slopes in the absence of sufficient counter-measures (Figure 3). Soil erosion processes were monitored by the Soil Conservation Research Programme (SCRIP), a long-term research network initiated in 1981 (Hurni 1982). Long-term analysis shows that the amount of soil loss on cultivated slopes ranges from a few tonnes per hectare and year (t/ha/yr) to more than 300 t/ha/yr (SCRIP 2000). In the long term, an average of approximately 40 t/ha/yr of soil loss was measured on cropland plots, while much less was measured on plots covered by grassland and forestland (Hurni 1993). The impact on soil productivity and agricultural production was shown to be very significant, exhibiting an almost linear correlation with soil depth (Belay Tegene 1990).

In the Ethiopian mountains, soil degradation due to water erosion remains a major threat to sustained agricultural production, as soils on slopes are washed away within a few human generations of land use. Both soil erosion models (Kaltenrieder 2007) and field observations confirm the importance of vegetation cover or, alternatively, structural measures such as soil



Fig. 3
Ploughing a steep slope at the Andit Tid Soil Conservation Research Programme (SCRCP) Research Site in Northern Shewa has led to extreme soil degradation, as the area has been agriculturally used for over 600 years. (Photo by Hans Hurni, 1982)

or stone bunds for protecting the soil against degradation. In addition, soil conservation measures have the potential to significantly improve agricultural production (Amare Bantider 2007; Birru Yitafaru 2007), not only in the accumulation areas behind the bunds but also in larger catchments. This has been shown by monitoring yields over extended periods of time (Kohler 2004; Loetscher 2004).

12.2.5 Water regime and pollution changes

Throughout the Highlands, immediate surface runoff has generally been augmented by intensified land use and advanced soil degradation, thereby benefiting the lowland areas in Sudan and Egypt to which part of the surface runoff is drained. Comparison of long-term data from small test plots throughout the Highlands (Hurni et al 2005), but also in the larger Lake Tana Basin, clearly confirmed this trend, despite the fact that rainfall amounts remained more or less similar during the observation periods of 13 to 44 years (Birru Yitafaru 2007). In terms of pollution, increased soil erosion in the catchments also augmented the sedimentation rates. This poses a problem for irrigation reservoirs in the lowlands, which are being filled with sediment. Soil and water conservation reduces sediment delivery not only on farm plots but, to a lesser extent, in entire catchments (Schum 2004; Admasu Amare 2005).

12.3 Drivers and impacts of soil degradation

While the previous section looked at the direct and indirect drivers of land degradation (MA 2005), this section focuses more closely on the drivers of soil degradation by water erosion. This is the key land degradation process in the Ethiopian Highlands once land has been deforested.

In assessments of soil degradation the direct drivers are typically termed 'bio-physical', as they are factors included e.g. in soil erosion models such as the Universal Soil Loss Equation (USLE) (Wischmeier and Smith 1978; Hurni 1987; Kaltenrieder 2007). Indirect drivers are usually found in the psychological, social, political, economic and institutional spheres, impacting livelihoods based on rural farming and livestock rearing, as well as in the institutions governing the populations that engage in these activities. Determinants of land degradation were analysed using primary and secondary data at the household and farm plot levels for selected watersheds (e.g. Getachew Adugna 2005).

12.3.1 Bio-physical drivers of soil degradation

The most important bio-physical drivers of soil degradation in the Ethiopian Highlands are (a) removal of vegetation cover, and (b) harmful agricultural management practices (Hurni 1990). Relating to (a), negative changes in soil cover are the most important drivers of the increase in natural rates of soil erosion by a factor between 100 and 1000, i.e. from much less than 1 t/ha/yr under natural forestland up to 300 t/ha/yr (Herweg and Stillhardt 1999; Alebachew Mamo 2006) on cultivated or degraded land. Once the vegetation cover is removed, factors such as the steepness, length and shape of a slope become important, as does rainfall erosivity. Another key factor in soil loss modelling is that soils in the Ethiopian Highlands are surprisingly resistant to water erosion due to their favourable depth, texture, structure and organic matter content, which give them good qualities in terms of infiltration and water-holding capacity, at least before they are heavily degraded (Hurni 1987).

Concerning (b), improved agricultural management practices have the potential to reduce soil erosion on farm plots by a factor of up to 100, provided that farmers take appropriate measures to combat soil erosion. Indigenous soil and water conservation practices have been documented; their effectiveness, however, is limited, and their extent is only local and not sufficiently widespread

to control soil erosion significantly. Inappropriate infrastructure such as foot-paths or steep drainage ditches also contributes to accumulated surface runoff and accelerated soil erosion (Herweg and Stillhardt 1999).

12.3.2 Socio-economic drivers of soil degradation

Ethiopian farmers do not perceive soil degradation to be a problem for agriculture, let alone a life-threatening issue affecting the productivity of the soil (Hurni 1979). Of course some runoff processes are perceived as immediately dangerous, e.g. when a gully expands backwards into the back yard of a homestead, which is rare. The psychological factor of individual perception of soil erosion as a non-threatening process can be explained by the slow overall pace of soil erosion; normally, it takes 5–10 human generations of intensive land use before a deep soil is totally exhausted. Consequently, when conservation programmes tried to retain water and sediment in a field by introducing soil and water conservation structures, farmers usually considered this to be a counter-measure against better drainage; they failed to perceive the important beneficial effect of long-term sustainable use of the soil (Herweg and Stillhardt 1999).

From a sociological point of view, many forms of cooperation between farm households exist, particularly in relation to specific farming operations, such as sharing oxen or maintaining common waterways between field boundaries. The latter also helps to reduce the severity of soil erosion. At the economic level, farming was largely subsistence-oriented in the past and remains so in remote areas, where about 80% of Ethiopia's farmers live. Institutionally, land security has not been granted to farmers over longer periods of time, thus preventing them from developing a keen interest in investing in the land for long-term productivity (Ludi 1994, 2002; Amare Bantider 2007). Present land regulations provide relative security, although the land is still owned by the regional states. Moreover, land security has been negatively influenced by political instability.

12.3.3 Impacts of soil degradation

In a spatial context, the overall progress of soil degradation is relatively slow in the Ethiopian Highlands; this has to do with the fact that even today only about 30% of the Highlands are cultivated, while the rest consists of fallow land, grassland and some forestland. On steep land that is currently cultivated, however, the rate of soil degradation is high in global terms. The bio-

physical impacts of soil erosion are both short- and long-term. In the short term, many rills develop on cultivated fields during the rainy seasons, which can damage crop seedlings. In the longer term, the cumulative effect of rill erosion has negative impacts on the soil, reducing soil depth, water-holding capacity, soil fertility and organic matter content or cation exchange capacity, which, in turn, leads to reduced vegetation growth and diminishes crop production. Furthermore, soil accumulation in valley bottoms and at the foot of slopes negatively affects agriculture there as well, and the sediments are prone to gully erosion. Many examples of these impacts have been documented both within the framework of the NCCR North-South programme (Amare Bantider 2007; Birru Yitafaru 2007; Gebeyaw Tilahun 2007; Hurni 2007) and in earlier studies (Hurni 1993; Solomon Abate 1994; Herweg and Stillhardt 1999; Gete Zeleke 2000).

The socio-economic impacts of soil erosion are also considerable, since decline in soil productivity leads to decreased yields (Belay Tegene 1990). This was the case particularly in the last century, during which the rural population of Ethiopia grew by a factor of 5–6 (Hurni et al, in preparation); together with increased pressure on the land and slow economic development, this led to widespread poverty. Increased land-use competition has been observed in the rural context at the expense of forestland and grassland, leading to problems with livestock feed and health, particularly among draught animals (Grünenfelder 2005; Amare Bantider 2007).

12.3.4 Farmers' responses to soil degradation

Responses by farmers to soil degradation have been minimal, as expected, despite the obvious cumulative effects of soil degradation and the threat of its acceleration in the second half of the 20th century. A number of known indigenous soil and water conservation technologies and management systems have been documented (Hurni 1984; Krüger et al 1997; Ludi 2002; Amare Bantider 2007; Birru Yitafaru 2007) and partially applied. However, their effectiveness, and particularly their overall extent, are estimated to be less than 10% of what would be needed to reduce soil erosion to tolerable levels (Hurni 1984). The main response to extreme soil degradation is that farmers stop cultivating the land and let it go fallow, in the hope that soil regeneration will take place at an accelerated rate. This process, however, is 10 to 100 times slower than the process of soil erosion (Hurni 1993); thus a 10–100 year fallow period would be needed for every year of cropping. Another strategy is to change land use from cropping to reforestation. For-

est plantations, however, require rural access roads for commercialisation; hence this strategy has been implemented only in places where distances to roads were small (Amare Bantider 2007).

12.4 Experiences with sustainable land management

Sustainable land management addresses land in its broader sense, i.e. including soil, water, vegetation and wildlife resources and their spatial contexts. Sustainable land management means that land is managed in such a way that future generations will be able to fulfil their needs just as the present generation can (WCED 1987). In this section, however, we will address only those aspects on which NCCR North-South research has focused since 2001: soil and water conservation, protected area management, and improved water management.

12.4.1 Soil and water conservation

The need for introducing soil and water conservation measures on agricultural land is an issue of concern not only to the international research and development communities, where the debate originated, but increasingly to Ethiopian scholars, experts, and even farmers (Endris Damtew 2006; Alemayehu Assefa 2007). While food-for-work schemes gradually expanded as of the late 1970s, there was a general lack of guidance regarding what technologies would be most appropriate, and what approaches most suitable (Erny 2004).

From a methodological point of view, it is important to develop further the models used to predict soil erosion processes and the effects of soil conservation technologies (Figure 4). Future models should enable predictions not only within but also outside the catchments where SCRP research sites are located. Additionally, systemic extrapolations can be made based on qualitative assessments (Hurni et al 2008) or by drawing synthetic conclusions (e.g. Hösli 2005; Hurni 2005, 2007). Guidelines for planning, designing and implementing appropriate technologies of soil and water management have been developed since the early 1980s; they were upgraded (e.g. Hurni, in press) and have been widely applied since then.

12.4.2 Protected area management

The NCCR North-South was engaged in one of the protected areas of Ethiopia in 2004, following up on studies carried out by Swiss and Ethiopian



Fig. 4
Development of bench terraces over a 20-year period from soil bunds that were implemented in 1983, leading to sustainable agricultural production even on this steep slope at the Maybar Soil Conservation Research Programme (SCRPR) Research Site in Wello. (Photo by Sabina Erny, 2003)

researchers since 1965. Eva Ludi and her team carried out a study in the Simen Mountains (Grünenfelder 2005; Hurni 2005; Bircher 2006; Schild 2006; Ludi 2007). This study was conducted 10 years after a comprehensive appraisal of sustainable development had been made in the area (Hurni and Ludi 2000). According to Hurni et al (2008), “institutional approaches have changed considerably since the establishment of the Simen Mountains National Park in 1969”. Prior to 1990 a top-down approach was used to park management; this sometimes led to violent conflicts. A more decentralised approach was introduced after the change of government in 1991, leading to more participation in management. At the time of writing the present synthesis, the government had prepared a proclamation to once again place the national parks under federal management. The Simen Mountains National Park, however, may continue to be administered by the regional authorities, as the national government acknowledges its successful management during the past 15 years.

12.4.3 Improved water management

The introduction of soil and water conservation measures in catchments is assumed to lead to improved water management regimes. Hurni et al (2005), in analysing their long-term test plot experiments, showed how land-use intensification and soil degradation had increased overall immediate surface

runoff and sediment concentration in rivers. Birru Yitaferu (2007) confirmed this trend observed in small catchments by providing evidence of increased total runoff in the Lake Tana Basin over the last few decades, despite no change in total annual rainfall. Schum (2004) showed that a small number of precipitation events in the rainy season lead to above-average erosion and account for a large portion of the sediment load. The time during which heavy precipitation occurs appears to be most decisive with respect to annual sediment load. Provided that sedimentation can be retarded, natural lakes could serve as sources of irrigation (Strebel 2007); their water tables may even be modified, as in the case of Lake Maybar in Wello (Strahm 2007), if conflicts over the use of the land and irrigation water can be negotiated and mitigated among stakeholders (Coendet 2007).

12.5 Research gaps and questions

12.5.1 Ongoing and emerging challenges

The challenges in developing rural Ethiopia lie in increasing productivity in all sectors in rural areas. As underlined by Hurni (2007), “sustainable land management must become the basis of agricultural activity on all land. Policies addressing rural–urban linkages, land tenure issues, and questions of demographic transition, as well as issues of education and health, can be particularly supportive in accelerating this change.” This would require a sectoral transition, with less dominance of agriculture and more development of the secondary and tertiary sectors. This would bear the potential of accelerating change, though probably not without generating social and public security problems, which would need to be given special attention. Demographic transition is an additional issue that needs to be taken into account; this transition may lead to new identities, “moving from association with traditional rural Ethiopia to association with a modern, interlinked rural–urban landscape” (Hurni 2007).

12.5.2 Research gaps

The following gaps in research appear most important with respect to the Ethiopian Highlands:

1. Locally effective direct and indirect drivers will have to be carefully accounted for in research. Furthermore, it will be important to observe how quickly the sectoral change in towns affects rural settings.

2. Global as well as more indirect drivers will increasingly affect sustainable development in Ethiopia. Climate change, particularly through changes in rainfall amounts and patterns and through temperature increases, will seriously affect agricultural production and ecology in both positive and negative terms that are still unknown. Globalisation in terms of trade, technology transfer and information exchange will become increasingly important and affect both urban and rural livelihoods – areas in which research has a key role to play.
3. A combination of local and global drivers will pose a most likely unprecedented challenge to the Ethiopian Highlands, for which traditional means of governance may not suffice.

Research capacity in Ethiopia is still relatively modest in view of these challenges; its development and appropriate focusing is most timely and important. A number of research questions are currently being addressed and will contribute to sustainable land management in the Ethiopian Highlands (see Box). Research partnerships between institutions in the North and in Ethiopia are a means by which new technologies and local knowledge can be shared in a way that each partner benefits from the relative competence of the other. Lessons to be learned will be pertinent not only in the Ethiopian context, but also for international stakeholders.

Box: Research questions relating to sustainable land management

- Soil and water conservation: what are the most suitable technologies and approaches for reducing soil erosion and other processes of land degradation to tolerable levels while enhancing the overall productivity of the land for sustainable rural development?
- Protected area management: what institutional mechanisms are most suitable for attaining the goals of conserving wildlife and wildlife habitats while mitigating existing or potential conflicts with local land users and other stakeholders interested in protected areas?
- Water management: what are the most suitable watershed development models that allow more intensive use of the water resources while taking account of climate and global change and fulfilling the needs of downstream users?
- Institutions and staffing: what is the most appropriate institution and staff development policy for proper natural resource management?

Endnotes

Full citation for this article:

Hurni H, Solomon Abate, Amare Bantider, Berhanu Debele, Ludi E, Portner B, Birru Yitafaru, Gete Zeleke. 2010. Land degradation and sustainable land management in the Highlands of Ethiopia. *In: Hurni H, Wiesmann U, editors; with an international group of co-editors. Global Change and Sustainable Development: A Synthesis of Regional Experiences from Research Partnerships. Perspectives of the Swiss National Centre of Competence in Research (NCCR) North-South, University of Bern, Vol. 5. Bern, Switzerland: Geographica Bernensia, pp 187–207.*

Acknowledgements:

The authors are grateful to the Swiss National Centre of Competence in Research (NCCR) North-South: Research Partnerships for Mitigating Syndromes of Global Change, co-funded by the Swiss National Science Foundation (SNSF) and the Swiss Agency for Development and Cooperation (SDC), which initiated the majority of studies carried out since 2001 as part of its research theme on natural resource management in the Ethiopian Highlands in the Joint Area of Case Studies (JACS) Horn of Africa (HOA). Long-term data on soil erosion and conservation were collected by the Soil Conservation Research Programme (SCRIP), which was initiated in 1981 by the University of Bern in collaboration with the Ethiopian Ministry of Agriculture, and is now partly carried out by the Amhara Regional Agricultural Research Institute (ARARI). This article was written as part of a synthesis carried out by the NCCR North-South in all its JACS and research packages.

¹ Hans Hurni is Professor of Geography and Sustainable Development at the University of Bern, Switzerland. He is also the Director of the Swiss National Centre of Competence in Research (NCCR) North-South, hosted by the Centre for Development and Environment (CDE), University of Bern, and responsible for a number of research projects related to natural resource management, soil and water conservation, smallholder agriculture, rural transformation and sustainable development in Africa, Asia and Latin America.

E-mail: hans.hurni@cde.unibe.ch

² Solomon Abate holds a PhD in Natural Resources Management from the Faculty of Natural Sciences, University of Bern, Switzerland. He is Regional Coordinator for the Eastern Nile Watershed Programme at the Eastern Nile Technical Regional Office (ENTRO), Nile Basin Initiative, Addis Abeba, Ethiopia, and is responsible for planning, managing and coordinating the implementation of watershed projects and related activities in the region.

E-mail: sabate@nilebasin.org

³ Amare Bantider holds a PhD in Geography and Sustainable Land Management. Currently he is Assistant Professor at Dilla University, Ethiopia, and coordinating two research and capacity development projects entitled “Water and Environment” and “Doing Development with Young People in Ethiopia”. His research interest lies in sustainable land management, with a focus on land-use and land-cover changes, soil and water conservation, and integrated watershed management.

E-mail: amare_zerfe@yahoo.com

⁴ Berhanu Debele is Head of the Regional Coordination Office of the Joint Area of Case Studies (JACS) Horn of Africa (HOA) of the Swiss National Centre of Competence in Research (NCCR) North-South, located in Addis Abeba, Ethiopia. His research interests include land evaluation, as well as soils and the environment.

E-mail: nccrhorn@ethionet.et and berhanudebele@gmail.com

⁵ Eva Ludi holds a PhD in Natural Sciences and is a Research Fellow at the Overseas Development

Institute (ODI) in London, UK. Her policy-oriented research projects and advisory services focus on natural resource governance, with a special focus on soil, water and protected areas, climate change adaptation in complex rural environments, and livelihoods-focused sustainable development, including support of cash crop-dependent smallholder producers particularly in Ethiopia and other sub-Saharan African countries.

E-mail: e.ludi@odi.org.uk

⁶ Brigitte Portner is a research scientist and a PhD candidate at the Centre for Development and Environment, University of Bern. She holds a Master's degree in Geography from the Faculty of Science, University of Bern, Switzerland. She has a particular interest in environmental governance, with a regional focus on Eastern Africa and Central America. Her current research focuses on the impacts of global biofuel demand and production.

E-mail: brigitte.portner@cde.unibe.ch

⁷ Birru Yitafere holds a PhD in Natural Sciences focusing on land resource management. He is Director of Soil and Water Research of the Amhara Regional Agricultural Research Institute (ARARI) in Bahr Dar, Ethiopia. He is currently responsible for a number of research projects and programmes, such as the Nile Irrigation and Drainage Project, research projects on sustainable water harvesting and institutional strengthening, and further watershed-based research.

E-mail: birru_yitafere2002@yahoo.com

⁸ Gete Zeleke holds a PhD focusing on Natural Resource Management, and he is General Manager of Avallo International Research and Development (AIRD), Addis Abeba, Ethiopia. His research interests include assessing soil erosion processes, land evaluation, sustainable land management, and climate change from a natural resource management perspective.

E-mail: gete_2004@yahoo.com or g.zeleke@cgiar.org

References

Publications elaborated within the framework of NCCR North-South research are indicated by an asterisk (*).

- * Admasu Amare. 2005. *Study of Sediment Yield from the Watershed of Angereb Reservoir* [MSc thesis]. Alemaya, Ethiopia: Alemaya University. Also available at: http://www.cde.unibe.ch/University/TTD_Un.asp; accessed on 7 October 2009.
- * Alebachew Mamo. 2006. *Spatial and Temporal Variation of Soil Degradation under Different Land Use / Cover in the Eastern Escarpment of Wollo, Ethiopia: The Case of Golo-Tiso Catchment* [MSc thesis]. Mekele, Ethiopia: Mekele University. Also available at: http://www.cde.unibe.ch/University/TTD_Un.asp; accessed on 7 October 2009.
- * Alemayehu Assefa. 2007. *Impact of Terrace Development and Management on Soil Properties in Anjeni Area, West Gojam* [MSc thesis]. Addis Abeba, Ethiopia: Addis Abeba University. Also available at: http://www.cde.unibe.ch/University/TTD_Un.asp; accessed on 7 October 2009.
- Alemneh Dejene, Gete Zeleke, Solomon Abate, Lule M, editors. 2003. *Towards Sustainable Agriculture and Rural Development in the Ethiopian Highlands. Proceedings of the Technical Workshop on Improving the Natural Resources Base and Rural Well-being, Bahr Dar, Ethiopia, November 25–27, 2003*. Environment and Natural Resources Working Paper No. 18. Rome, Italy: Food and Agriculture Organization of the United Nations (FAO).
- * Amare Bantider. 2007. *Landscape Transformation and Opportunities for Sustainable Land Management along the Eastern Escarpment of Wollo (EEW), Ethiopia* [PhD dissertation]. Bern, Switzerland: University of Bern.
- Bard K, Coltorti M, Diblasi MC, Dramis F, Fattovich R. 2000. The environmental history of Tigray (Northern Ethiopia) in middle and late Holocene: A preliminary outline. *African Archaeological Review* 17(2):65–86.
- Belay Tegene. 1990. *Erosion: Its Effects on Properties and Productivity of Eutric Nitosols in Gununo Area, Southern Ethiopia and Some Techniques of Its Control* [PhD dissertation]. Bern, Switzerland: University of Bern.
- * Bircher K. 2006. *Wildtiere und ihre aktuellen and potentiellen Habitate im Osten des Simen Mountains National Park, Äthiopien* [MSc thesis]. Bern, Switzerland: University of Bern. Also available at: http://www.cde.unibe.ch/University/TTD_Un.asp; accessed on 7 October 2009.
- * Birru Yitaferu. 2007. *Land Degradation and Options for Sustainable Land Management in the Lake Tana Basin (LTB), Amhara Region, Ethiopia* [PhD dissertation]. Bern, Switzerland: University of Bern.
- * Coendet A. 2007. *Irrigation Development in the Lake Maybar Area, South Wollo, Ethiopia* [MA thesis]. Bern, Switzerland: University of Bern. Also available at: http://www.cde.unibe.ch/CDE/PubMed_Detail2_CD.asp?ID=1682; accessed on 26 November 2009.
- CSA [Central Statistical Agency of Ethiopia]. 2006. *Central Statistical Agency of Ethiopia*. Available at: <http://www.csa.gov.et>; accessed on 1 November 2006.
- Darbyshire I, Lamb H, Mohammed Umer. 2003. Forest clearance and regrowth in northern Ethiopia during the last 3000 years. *The Holocene* 13(4):537–546.
- Dessalegn Rahmato. 2001. *Environmental Change and State Policy in Ethiopia: Lessons from Past Experiences*. Monograph Series 2. Addis Abeba, Ethiopia: Forum for Social Studies.
- Dessalegn Rahmato. 2004. *Searching for Tenure Security? The Land System and New Policy Initiatives in Ethiopia*. Discussion Paper No. 12. Addis Abeba, Ethiopia: Forum for Social Studies.
- EHRIS [Ethiopian Highlands Reclamation Study]. 1986. *Ethiopia: Final Report*. Vol. 1. Rome, Italy: Food and Agriculture Organization of the United Nations (FAO).
- * Endris Damtew. 2006. *Comparative Financial Evaluation of Soil Conservation Measures in North Wollo: The Case of Golo River Catchment, Habru Wereda* [MSc thesis]. Alemaya, Ethiopia: Alemaya University. Also available at: http://www.cde.unibe.ch/University/TTD_Un.asp; accessed on 7 October 2009.

- * Erny S. 2004. *Long-term Effects of Soil Erosion and Soil Conservation Measures* [MSc thesis]. Basel, Switzerland: University of Basel.
- * Gebeyaw Tilahun. 2007. *Soil Fertility Status as Influenced by Different Land Uses in Maybar Areas of South Wello Zone, North Ethiopia* [MSc thesis]. Haramaya, Ethiopia: Haramaya University. Also available at: http://www.cde.unibe.ch/University/TTD_Un.asp; accessed on 7 October 2009.
- * Getachew Adugna. 2005. *Determinants of Land Degradation in the Lake Tana Basin and Its Implications for Sustainable Land Management: The Case of Angereb and Gishe Abbay Watersheds* [MSc thesis]. Haramaya, Ethiopia: Haramaya University. Also available at: http://www.cde.unibe.ch/University/TTD_Un.asp; accessed on 7 October 2009.
- Gete Zeleke. 2000. *Landscape Dynamics and Soil Erosion Process Modelling in the North-western Ethiopian Highlands*. African Studies Series A16. Bern, Switzerland: Geographica Bernensia.
- * Grünenfelder J. 2005. *Livestock in the Simen Mountains, Ethiopia: Its Role for the Livelihoods and Land Use of Local Smallholders* [MSc thesis]. Bern, Switzerland: University of Bern. Also available at: http://www.cde.unibe.ch/University/TTD_Un.asp; accessed on 7 October 2009.
- Herweg K, Stillhardt B. 1999. *The Variability of Soil Erosion in the Highlands of Ethiopia and Eritrea: Average and Extreme Erosion Patterns*. Soil Conservation Research Programme (SCRIP) Research Report No. 42. Addis Abeba, Ethiopia and Bern, Switzerland: Ministry of Agriculture and University of Bern.
- * Hösl C. 2005. *Visualisierung und Modellierung geographischer Daten von Äthiopien über Internet und Intranet zur Unterstützung von Planungs- und Entscheidungsfindungsprozessen* [MSc thesis]. Bern, Switzerland: University of Bern. Also available at: http://www.cde.unibe.ch/University/TTD_Un.asp; accessed on 7 October 2009.
- Holden S, Barrett CB, Fitsum Hagos. 2006. Food-for-work for poverty reduction and the promotion of sustainable land use: Can it work? *Environment and Development Economics* 11:15–38.
- Hurni H. 1979. Semien – Äthiopien: Methoden zur Erfassung der Bodenerosion. *Geomorphica* 4:151–182.
- Hurni H. 1982. *Soil Conservation Research Programme: Inception Report*. Bern, Switzerland and Tokyo, Japan: University of Bern and United Nations University.
- Hurni H. 1984. *Soil Conservation Research Programme: Third Progress Report (Year 1983)*. Bern, Switzerland and Tokyo, Japan: University of Bern and United Nations University.
- Hurni H. 1987. Erosion – productivity – conservation systems in Ethiopia. In: Pla Sentis I, editor. *Soil Conservation and Productivity*. Proceedings of the 4th International Soil Conservation Conference, Maracay, Venezuela, 3–9 November 1985. Maracay, Venezuela: Instituto de Edafologia, Universidad Central de Venezuela, pp 654–674.
- Hurni H. 1990. Degradation and conservation of soil resources in the Ethiopian Highlands. In: Messerli B, Hurni H, editors. *African Mountains and Highlands: Problems and Prospects*. Bern, Switzerland and Addis Abeba, Ethiopia: University of Bern and African Mountains Association.
- Hurni H. 1993. Land degradation, famine, and land resource scenarios in Ethiopia. In: Pimentel D, editor. *World Soil Erosion and Conservation*. Cambridge, UK: Cambridge University Press, pp 27–61.
- Hurni H. 1998. *Agroecological Belts of Ethiopia: Explanatory Notes on Three Maps at a Scale of 1:1,000,000*. Soil Conservation Research Programme (SCRIP) Research Report No. 43. Addis Abeba, Ethiopia and Bern, Switzerland: Ministry of Agriculture and Centre for Development and Environment (CDE).
- * Hurni H. 2005. *Decentralised Development in Remote Areas of the Simen Mountains, Ethiopia*. IP2 Working Paper No. 1. NCCR North-South Dialogue Series. Bern, Switzerland: Swiss National Centre of Competence in Research (NCCR) North-South. Also available at: http://www.nccr-north-south.unibe.ch/publications/Infosystem/On-line%20Dokumente/Upload/Decentralised%20Development%20Simen%20Ethiopia_Hurni%202005%281%29.pdf; accessed on 5 January 2010.

- * Hurni H. 2007. *Challenges for Sustainable Rural Development in Ethiopia*. Addis Abeba, Ethiopia: Faculty of Technology, Addis Abeba University.
- Hurni H. In press. *Soil and Water Conservation in Ethiopia: Guidelines for Development Agents*. 2nd edition [1986¹]. Addis Abeba, Ethiopia and Bern, Switzerland: Menschen für Menschen and Centre for Development and Environment (CDE).
- * Hurni H, Kebede Tato, Gete Zeleke. 2005. The implications of changes in population, land use, and land management for surface runoff in the Upper Nile Basin Area of Ethiopia. *Mountain Research and Development* 25(2):147–154.
- * Hurni H, Leykun Abune, Ludi E, Mulugeta Woubshet. 2008. The evolution of institutional approaches in the Simen Mountains National Park, Ethiopia. In: Galvin M, Haller T, editors. *People, Protected Areas and Global Change: Participatory Conservation in Latin America, Africa, Asia and Europe*. Perspectives of the Swiss National Centre of Competence in Research (NCCR) North-South, University of Bern, Vol. 3. Bern, Switzerland: Geographica Bernensia, pp 287–323.
- Hurni H, Ludi E. 2000. *Reconciling Conservation with Sustainable Development: A Participatory Study Inside and Around the Simen Mountains National Park, Ethiopia*. Bern, Switzerland: Centre for Development and Environment (CDE).
- * Hurni H, with contributing authors. In preparation. *Soil Erosion and Conservation in Ethiopia* [working title]. Book manuscript available from Hans Hurni.
- * Kaltenrieder J. 2007. *Adaptation and Validation of the Universal Soil Loss Equation (USLE) for the Ethiopian-Eritrean Highlands* [MSc thesis]. Bern, Switzerland: University of Bern. Also available at: http://www.cde.unibe.ch/University/TTD_Un.asp; accessed on 7 October 2009.
- Keeley J, Scoones I. 2000. Knowledge, power and politics: The environmental policy-making process in Ethiopia. *Journal of Modern African Studies* 38(1):89–120.
- Keeley J, Scoones I. 2003. *Understanding Environmental Policy Processes: Cases from Africa*. London, UK: Earthscan.
- * Kohler R. 2004. *The Status and Dynamics of Agricultural Production and Productivity in a Small Catchment Area in Anjeni* [MSc thesis]. Zurich, Switzerland: Swiss Federal Institute of Technology Zurich (ETHZ).
- Krüger HJ, Berhanu Fantew, Yohannes Gebre Michael, Kefeni Kejela. 1997. *Inventory of Indigenous Soil and Water Conservation Measures on Selected Sites in the Ethiopian Highlands*. Soil Conservation Research Programme (SCRIP) Research Report No. 34. Bern, Switzerland and Addis Abeba, Ethiopia: University of Bern and Ministry of Agriculture.
- * Loetscher M. 2004. *Long-term Dynamics of Agricultural Production and Productivity* [MSc thesis]. Zurich, Switzerland: Swiss Federal Institute of Technology Zurich (ETHZ).
- Ludi E. 1994. *Handlungsspielraum kleinbäuerlicher Familien und Handlungsstrategien zur Verbesserung ihrer Lebenssituation. Ein Fallbeispiel aus Anjeni, Äthiopien* [MSc thesis]. Bern, Switzerland: University of Bern.
- Ludi E. 2002. *Economic Analysis of Soil Conservation: Case Studies from the Highlands of Amhara Region, Ethiopia* [PhD dissertation]. African Studies Series A18. Bern, Switzerland: University of Bern, Geographica Bernensia.
- * Ludi E. 2007. *Simen Mountains Study 2004: Intermediate Report on the 2004 Field Expedition to the Simen Mountains in Northern Ethiopia*. 2nd edition [2005¹]. NCCR North-South Dialogue No. 6. Bern, Switzerland: Swiss National Centre of Competence in Research (NCCR) North-South.
- MA [Millennium Ecosystem Assessment]. 2005. *Ecosystems and Human Well-being: Synthesis*. Washington, D.C.: Island Press.
- Nyssen J, Mitiku Haile, Moeyersons J, Poesen J, Deckers J. 2004a. Environmental policy in Ethiopia: A rejoinder to Keeley and Scoones. *Journal of Modern African Studies* 42(1):137–147.
- Nyssen J, Poesen J, Mitiku Haile, Moeyersons J, Deckers J, Hurni H. 2009. Effects of land use and land cover on sheet and rill erosion rates in the Tigray Highlands, Ethiopia. *Zeitschrift für Geomorphologie* 53(2):171–197. doi:10.1127/0372-8854/2009/0053-0171
- Nyssen J, Poesen J, Moeyersons J, Deckers J, Mitiku Haile, Lang A. 2004b. Human impact on the environment in the Ethiopian and Eritrean highlands – a state of the art. *Earth-Science Reviews* 64(3–4):273–320.

- Ritler A. 2001. *Wald, Landnutzung und Landschaft im zentralen und nördlichen Äthiopien 1865–1930* [PhD dissertation]. Bern, Switzerland: University of Bern.
- * Rüeeggsegger M. 2008. *Kaffeeanbau in Äthiopien unter verschiedenen Klimaszenarien* [MSc thesis]. Bern, Switzerland: University of Bern. Also available at: http://www.cde.unibe.ch/University/TTD_Un.asp; accessed on 7 October 2009.
- * Schild R. 2006. *Wald und Waldmanagement im und um den Simen Mountains National Park, Äthiopien* [MSc thesis]. Bern, Switzerland: University of Bern. Also available at: http://www.cde.unibe.ch/CDE/PubMed_Detail2_Cd.asp?ID=1681; accessed on 5 January 2010.
- * Schum C. 2004. *Modelling River Discharge and Sediment Yield in a Small Catchment in the Highlands of Ethiopia: An Application of the Model Erosion 3D in Anjeni (Gojam) Using a Multi-annual Data Series* [MSc thesis]. Bern, Switzerland: University of Bern. Also available at: http://www.cde.unibe.ch/University/TTD_Un.asp; accessed on 7 October 2009.
- SCRIP [Soil Conservation Research Programme]. 2000. *Soil Erosion and Conservation Database 7*. Reports on the 7 research stations. Bern, Switzerland and Addis Abeba, Ethiopia: Centre for Development and Environment (CDE) and Ministry of Agriculture.
- Solomon Abate. 1994. *Land Use Dynamics, Soil Degradation and Potential for Sustainable Use in Metu Area, Illubabor Region, Ethiopia*. African Studies Series A13. Bern, Switzerland: Geographica Bernensia.
- * Solomon Abebe. 2005. *Land-use and Land-cover Change in Headstream of Abbay Watershed, Blue Nile Basin, Ethiopia* [MSc thesis]. Addis Abeba, Ethiopia: University of Addis Abeba. Also available at: http://www.cde.unibe.ch/University/TTD_Un.asp; accessed on 7 October 2009.
- * Strahm I. 2007. *Modelling Hydrology and Sedimentation in the Lake Maybar Area, Wello, Ethiopia* [MSc thesis]. Bern, Switzerland: University of Bern. Also available at: http://www.cde.unibe.ch/University/TTD_Un.asp; accessed on 7 October 2009.
- * Strebel A. 2007. *Sedimentation Processes in the Assabol Watershed in North Ethiopia: Hydrogeomorphology of the Sediments Filling the Reservoir and Resulting Techniques of Reservoir Management* [MSc thesis]. Bern, Switzerland: University of Bern. Also available at: http://www.cde.unibe.ch/CDE/PubMed_Detail2_Cd.asp?ID=1680; accessed on 5 January 2010.
- WCED [World Commission on Environment and Development]. 1987. *Our Common Future*. Oxford, UK: Oxford University Press. Also available at: <http://www.un-documents.net/wced-ocf.htm>; accessed on 19 August 2009.
- Webb P, Kumar S. 1995. Food and cash for work in Ethiopia: Experiences during famine and macroeconomic reform. In: Webb P, Kumar S, editors. *Employment for Poverty Reduction and Food Security*. Washington, D.C.: International Food Policy Research Institute.
- Wischmeier WH, Smith DD. 1978. *Predicting Rainfall Erosion Losses: A Guide to Conservation Planning*. Agriculture Handbook No. 537. Washington, D.C.: United States Department of Agriculture.
- * Yacob Arsano, Berhanu Debele, Ludi E, Seyoum Gebre Selassie. 2004. JACS Horn of Africa: Managing resources and disputes in uncertain environments. In: Hurni H, Wiesmann U, Schertenleib R, editors. *Research for Mitigating Syndromes of Global Change: A Transdisciplinary Appraisal of Selected Regions of the World to Prepare Development-oriented Research Partnerships*. Perspectives of the Swiss National Centre of Competence in Research (NCCR) North-South, University of Bern, Vol. 1. Bern, Switzerland: Geographica Bernensia, pp 141–182.
- Yeraswork Admassu. 1995. *Twenty Years to Nowhere: Property Rights, Land Management and Conservation in Ethiopia* [PhD dissertation]. Uppsala, Sweden: Uppsala University.

