13

Institutions and policy in the Blue Nile Basin

Understanding challenges and opportunities for improved land and water management

Amare Haileslassie, Fitsum Hagos, Seleshi B. Awulachew, Don Peden, Abdalla A. Ahmed, Solomon Gebreselassie, Tesfaye Tafesse, Everisto Mapedza and Aditi Mukherji

Key messages

- In the past decades, both upstream and downstream countries of the Blue Nile Basin (BNB) had developed and adopted several policies and strategies related to land and water management. Yet there are important policy and institutional gaps that impeded adoption of improved land and water management strategies. An example of these gaps is the lack of upstream–downstream linkage and incentive-based policy enforcement mechanisms.
- In spite of long-standing efforts in improving land and water management in the BNB, achievements have been negligible to date. This is accounted for by land and water management policy and institutional gaps mentioned above. Addressing these gaps only at local level may impact the basin communities at large. Therefore, institutional arrangements need to be built across different scales (nested from local to international) that build trust, facilitate the exchange of information and enable effective monitoring required for successful water resources management (e.g. dam operation, cost and benefit sharing, demand management, etc.).
- Payment for environmental services (PES) is a potential incentive-based policy enforcement mechanism for improved land and water management and conflict resolution between upstream and downstream users both at the local scale and in the BNB at large. This potential must be comprehended to bring about a win-win scenario in upstream and downstream parts of the BNB.
- Financing improved land and water management practices is an expensive venture and mostly within a long-term period of returns. A fully farmer-financed PES scheme may not be financially feasible (at least in the short term). Therefore, options for user and state co-financing must be sought.

Introduction

Overview

Lives and livelihoods in the BNB are strongly linked with crop production and livestock management and, therefore, with land and water. Over 95 per cent of the food-producing sector in upstream areas (i.e. Ethiopia) is based on rain-fed agriculture. In Sudan, downstream, the Blue Nile supplies water for major irrigation development and also for livestock production (Haileslassie *et al.*, 2009). Agriculture is a system hierarchy stretching across plot, farm, watershed and basin. For such a hierarchy operating within the same hydrological system, such as the BNB, water flows create intra- and inter-system linkages, and therefore changes in one part of a basin will affect water availability and attendant livelihoods and ecosystem services (provision, regulation, support and cultural) in other parts.

In the BNB, threats to these co-dependent livelihoods arise from new dimensions like population growth and associated need for agricultural intensification (Haileslassie *et al.*, 2009). In this respect, a question arises as to how the current policy and institutions, at local and basin scales, enhance complementary associations between these co-dependent livelihoods.

Purposes and organization of this chapter

The purposes of this chapter are to:

- Explore the set-up and gaps of land and water management policy and institutions at different scales of the BNB.
- Identify determinants and intensity of adoption for improved land and water management practices and their implications for institutions and policy interventions.
- Assesses mechanisms for basin- and local-level upstream/downstream community cooperation through, for example, benefit-sharing by taking payment for environmental services as an example.

This chapter reports on challenges and opportunities of institutions and policy for improved land and water management in the BNB. It considers different spatial scales ranging from international and national via region, to watershed and community. Below we present the overall analytical framework, before addressing institutional set-ups and gaps, adoptions of improved land and water management technologies, payment for environmental services and benefic-sharing. The last section presents the overall conclusion, key lessons learnt and the policy implications thereof.

Analytical framework and methodology

In terms of analytical framework, the chapter follows a nested approach: from the local perception through to the international. It considers policy and institution interventions and its upstream–downstream impacts at the community, sub-catchment, basin and international levels, as appropriate. Each level of analysis involves different physical dynamics, stakeholders, policies and institutions, and therefore options for interventions. Where relevant, it also looks at the interactions between these levels. This chapter is synthesized based on different case studies representing different spatial scales in the BNB. Detailed methodologies for the respective level of studies are elaborated by Alemayehu *et al.* (2008), Mapedza *et al.* (2008), Gebreselassie *et al.* (2009) and Hagos *et al.* (2011).

Land and water management institutions and policy in the BNB: their set-up and gaps

In Ethiopia (upstream) and Sudan (downstream) parts of the BNB institutional arrangements related to land and water are broadly categorized into three different tiers: federal (national), regional (state) and local-level organizations. More recently, in Ethiopia, basin-level organizations have also come into the picture. Formal institutions are structured at federal and regional levels. Regional states adopt federal land and water institutions as they are, or, as in some cases, they develop region-specific institutions based on the general provisions given at the federal level. Informal institutions are locally instituted and may lack linkages with the formal institutions and among themselves. In this study, we focus on the assessment of federal land and water management institutions as they apply to regional, sub-basin and local scales. We focused only on those institutions and policy related to water resources, agriculture and environmental protection.

Land and water-related organizations

Bandaragoda (2000) defined institutions as established rules, norms, practices and organizations that provide a structure to human actions related to water management. The framework of Bandaragoda (2000) also presents the overall institutional framework in three broad categories: policies, laws and administration. Here we used this category to explore institutional performances of the BNB by (i) elaborating organizational attributes, (ii) developing a list of essential organizational design criteria and comparing these against its current state, and (iii) identifying missing key policy elements and instruments.

Organizational set-up, their attributes and coordination in the BNB

There are at least three federal and other subsidiary agencies and the same number, if not more, of NGOs, of regional bureaus/authorities working in the areas of land, water and environmental protection in Ethiopia (Haileslassie *et al.*, 2009). A comparable organizational structure is reported for Sudan (Hussein *et al.*, 2009). In Ethiopia, the Ministry of Water Resources (MoWR), Ministry of Agriculture and Rural Development (MoARD) and Ethiopian Environmental Protection Authority (EPA) are key actors, while in Sudan the Ministry of Irrigation and Water Resources (MIWR), Ministry of Agriculture and Forests (MoAF), Ministry of Animal Resources and Fisheries (MoARF) and Higher Council for Environment and Natural Resources (HCENR) are reported as important organizations for land and water management. Water user associations (WUAs) and irrigation cooperatives (IC) are the most common local organizations engaged in water management (e.g. Gezira). The role of a WUA is commonly restricted to the distribution of water between members, rehabilitation and maintenance of canals, and addressing water-related conflicts.

The presence of clear institutional objectives in the BNB is fairly well established (Haileslassie *et al.*, 2009; Hagos *et al.*, 2011). There are organizations with clear mandates, duties and responsibilities, and given by-laws. The policies and laws in place have also clear objectives, and some have developed strategies and policy instruments to meet these objectives (Haileslassie *et al.*, 2009; Hussein *et al.*, 2009; Hagos *et al.*, 2011).

However, there are important problems noticed in the organizational setting that affect activities and actors and, therefore, outputs (Table 13.1). A careful look into the work portfolios of ministries indicates the presence of overlaps in mandates between MoWR, MoARD and EPA in

Table 13.1 Assessment of institutional design criteria against current organizational structure and operations in the case study area (Tana-Beles sub-basin)

Institutional design criteria	*Key issues*	*Focus institutions* *MoWR*	 *MoARD*	 *EPA*
Clear institutional objectives	Key objectives from among the many objectives?	*Inter alia* inventory and development of the country's surface water and groundwater resources; basin-level water management and benefit-sharing	Development and implementing of a strategy for food security, rural development, and natural resources protection; development of rural infrastructure and agricultural research	Formulation of policies, strategies, laws and standards to foster social and economic development and the safety of the environment
	Key constraints in meeting these objectives?	Overlap with EPA and MoWR; high manpower turnover; frequent restructuring; weak enforcement capacity; lack of hierarchy; upstream downstream not considered	Overlap with MoWR and EPA; high manpower turnover; frequent restructuring; weak enforcement capacity	Overlap with MoWR and MoARD; high manpower turnover; weak enforcement capacity
Interconnectedness between formal and informal institutions	Relation between formal and informal institutions;	Note the linkage matrix	Note the linkage matrix	Note the linkage matrix
	Cases where informal institutions replace formal institutions?	Water user association	EDIAR gives some micro credit	
Adaptiveness	The common forms of adaptive management	Evolutionary management	Evolutionary management	Evolutionary management
Scale	Spatial scale	Hydrological boundary	Administrative boundary	Administrative boundary
Compliance capacity	Dealing with violations of norms;	Not clear	Not clear	
	typical forms of enforcement?	Command-control	Command-control	Command-control

Note: EDIAR is an informal institution in Ethiopia mainly engaged in burial services

Source: Haileslassie *et al.*, 2009

upstream and MoIWR, MoEPD and MoARF in downstream (Haileslassie *et al.*, 2009; Hussein *et al.*, 2009; Hagos *et al.*, 2011). For instance, MoWR and MoARD, in upstream areas, have responsibilities related to water resources development; MoWR focuses on medium and large-scale works while MoARD focuses on small-scale irrigation and micro-watershed management. The broad areas of integrated natural resources management also fall into the mandates of these two ministries and the EPA (Haileslassie *et al.*, 2009; Hagos *et al.*, 2011).

It seems there is a further dilemma of split jurisdiction between federal- and regional-level organizations that may create problems in implementation and enforcement. For example, environmental impact assessment (EIA) and water pollution control in the upstream portion also fall under the jurisdiction of EPA and MoWR. There is already possible overlapping of responsibility between general and broad mandates of EPA and regional environmental bureaus or authority in the field of pollution control. If these organizations work separately, this would lead to a clear duplication of effort and waste of resources. Interestingly, linkages and information-sharing mechanisms in place do not ensure institutional harmony and efficient information and resource flows.

Table 13.2 shows an example of information flows and linkages between organizations operating in land and water management in the upstream part of the BNB. It is apparent that horizontal communications between ministries and bureaus belonging to different sectors is seldom common. There are hardly any formal information flows and linkages between sectors. Lack of an integrated information management system exacerbates this problem. Therefore, organization of ministries, bureaus and departments seems to follow 'disciplinary' orientation while problems in the sector call for an interdisciplinary and integrated approach. In Sudan, Hussein *et al.* (2009) also indicated that a lack of coordination and formal information flow was a major threat to organizations' performance in the downstream part of the basin.

Table 13.2 Map of information flow and linkages between major actors in upper parts of the Blue Nile Basin

	BoARD	*BoWRD*	*EPLAUA*	*AARI*	*SHWISA (NGO)*	*Water Aid (NGO)*	*MoARD*	*MoWR*	*EPA*	*EIAR*
BoARD		IFL	IFL	FFL	FFL	NFL	FFL	IFL	IFL	IFL
BoWRD	IFL		IFL	IFL	IFL	FFL	NFL	FFL	IFL	NFL
EPLAUA	IFL	IFL		IFL	IFL	NFL	NFL	NFL	FFL	IFL
AARI	FFL	IFL	IFL		NFL	NFL	IFL	NFL	NFL	FFL
SHWISA (NGO)	FFL	IFL	IFL	IFL		NFL	NFL	NFL	NFL	NFL
Water Aid (NGO)	NFL	FFL	NFL	NFL	NFL		NFL	IFL	NFL	NFL
MoARD	FFL	NFL	NFL	NFL	NFL	NFL		IFL	IFL	FFL
MoWR	NFL	FFL	NFL	NFL	NFL	IFL	IFL		IFL	IFL
EPA	NFL	NFL	FFL	NFL	NFL	NFL	IFL	IFL		IFL
EIAR	NFL	NFL	NFL	NFL	NFL	NFL	NFL	NFL	NFL	

Notes: Linkages: FFL, institutionalized flow and linkage; IFL, indirect flow and linkage; NFL, no flow and linkage. Actors: AARI, Amhara Agricultural Research Institute; BoARD, Bureau of Agriculture and Rural Development; BoWRD, Bureau of Water Resources Development; EIAR, Ethiopian Institute of Agricultural Research; EPLAUA, Environmental Protection Land Administration and Land Use Authority; EPA, Environmental Protection Authority; MoARD, Ministry of Agriculture and Rural Development; MoWR, Ministry of Water Resources

Source: Hagos *et al.*, 2011

In both upstream and downstream parts of the BNB, ministries of water are responsible for water resources that are transboundary in nature and not confined within a regional state, while regional counterparts are responsible for water resources within their jurisdictions. At the same time, for example in the downstream part, MIWR is responsible for managing schemes (e.g. Sennar Dam) in the BNB. An important point here is that the central ownership of these resources is incompatible with decentralized management that both countries are following.

What is more relevant is that organizations involved in land and water management in the upstream and downstream part of the BNB were marked by frequent restructuring and reorganization over the last few years and the process seems to be going on. For example, since the 1990s, there has been an institutional reform process in water sectors of Sudan (Hussein *et al.*, 2009). Adjusting organizational responsibilities and frequent redesigning of organizational structures have certainly produced uncertainties and made capacity-building difficult. To achieve the objectives of sustainable outcome, the gaps mentioned in BNB organizations' attributes and coordination need to be addressed.

Enforcement capacity of organizations

Enforcement capacity of an organization is one of the important indicators of organizational performance. The point here is to see how violations of accepted institutions were dealt with and typical forms of enforcement (Table 13.1).

Overall, emerging evidence suggests that regulations on water resources management, pollution control, land use rights, watershed development, etc. are not effective because of weak enforcement capacity in both upstream and downstream parts of the BNB. A similar observation is reported by NBI (2006). For example, while the Ethiopian and Sudanese water development and environmental protection policies and laws recognize the need to take proper EIAs in pursuing any water-related development interventions, traditional practices still dominate. This problem is identified as more serious in the downstream part of the BNB (NBI, 2006). EPA complains of inadequate staff and resources to do proper enforcement of these environmental provisions. The poor enforcement capacity of institutions can also be linked to the absence of an integrated system of information management at the country or sub-basin level. While the land and water organizations, both in Sudan and Ethiopia, are mandated to collect and store relevant data to support decision making, the data collection is at best inadequate and haphazard. Information-sharing and exchange between organizations to support timely policy decision making and to encourage cooperation between upstream downstream regions are generally appraised as weak (NBI, 2006). In light of this, various organizations keep and maintain a wide range of data to meet their purposes (NBI, 2006).

Institutional adaptiveness

We have described the various aspects of land and water management institutions in the BNB. In this regard it is interesting to assess how these institutions evolved and the type of adaptive management pursued (Table 13.2). Hagos *et al.* (2011) suggested that adaptive evolutionary management is the typical type of strategy followed in drafting structuring of these organizations.

Organizational efficacy is measured not only in fulfilling daily work mandates but also in developing forward-looking solutions to emerging issues. One related issue in this regard is the adaptive capacity of institutions to exogenous factors. In general, in both upstream and downstream of the BNB, there is hardly any indication that the emerging challenges are reflected upon and strategies to address emerging issues are designed (Haileslassie *et al.*, 2009; Hussein *et* *al.*, 2009). There are allusions in the policy documents that envisaged how water sector and broader development strategies in upstream and downstream parts of the BNB are expected to provide mechanisms to mitigate some, if not all, of the environmental challenges. However, these strategies assume that there is plenty of water potential to tap into from the sub-basins. Economic water scarcity is considered a greater challenge than physical water scarcity. Climate change scenarios and their impact on water resources are hardly taken into account in the development of these strategies. This will obviously put sustainability of development efforts in both upstream and downstream parts of the basin under question.

Appropriateness of scale

The Ethiopian and Sudanese water policies advocate integrated water resources development, where the planning unit should be a river basin. It seems, however, that there is confusion in the definition of the appropriate scale. For example, in Ethiopia regional bureaus and federal office are organized on the basis of administrative scale (i.e. regions or the country). On the other hand, relevant water resources policy and watershed management guidelines advocate that the basin or watershed be the basic planning unit for intervention. In the downstream part of the BNB, the Ministry of Water Resources and Irrigation (MoWRI) in Sudan has organs operating at the basin and at the same time at the state level. A critical constraint against effective river basin management is the commonly prevalent conflict between boundaries of river basins and those of political units (nations, regions, districts, etc.). The administrative boundaries also pose potential constraint in management of small watersheds that fall between two smaller administrative units or farmers association. This calls for establishing viable and acceptable institutional mechanisms for shared management of water resources in the BNB.

Assessment of policy framework, elements and instruments

The policy framework

An example of how BNB policy framework considerations impact on important policy elements is depicted in Table 13.3. In the upstream part, environmental policy lacks climate change; upstream–downstream linkage; role of educational activities and need for research (Table 13.3; FDRE, 1997). The environmental framework act (2001) in Sudan also does not explicitly recognize important issues like climate change, despite a compelling evidence of climate change. The enforcement of some policy elements mentioned in the policy documents is constrained by the low level of regional states' implementation capacity (Hagos *et al.*, 2011; Haileslassie *et al.*, 2009). This is a major point of concern to reduce impacts of upstream-region intervention on downstream (e.g. siltations of water infrastructures in the downstream).

One of the most important water-related policies, strategies, regulations or guidelines in Ethiopia is the water resources management policy (MoWR, 1999). Sudan developed the first national water policy in 1992 and revised it in 2000 (NBI, 2006). A number of important policy elements mentioned in Table 13.3 are reflected in both countries' policy documents: community participation, institutional changes, duty of care and general intent of the policy/law jurisdiction. For the environmental policy. the water resources policy also lacks important elements such as climate scenarios, upstream–downstream linkage, role of education and the need for research and investigation.

The Integrated Water Resources Management (IWRM) approach in both upstream and downstream water policies has relevant provisions: regarding the needs for water resources

Table 13.3 Examples of essential elements of water and land management policies in Blue Nile Basin

Element	*WRMP*	*EPE*	*LULA*	*WSG*
General intent of the policy/law	✓	✓	✓	✓
Jurisdiction – spatial and administrative scales	✓	✓	✓	✓
Responsibility (establishes or enables commitment)	✓	✓	✓	✓
Specific goals and objectives	✗	✗	✗	✗
Duty of care (ethical, legal responsibility, attitude, responsibility or commitment)	✓	✓	✓	✓
Hierarchy of responsibilities ('rights and obligations' of hierarchies)	✗	✓	✓	✓
Institutional changes (statements of an intended course of action/needed reform or legal change)	✓	✓	✓	✓
Climate change scenarios/demand management	✗	✗	✗	✗
Upstream–downstream linkages (e.g. watershed level)	✗	✗	✓	✓
Role of educational activities	✗	✗	✗	✗
Research and investigation	✗	✗	✗	✗
Community participation	✓	✓	✓	✓
Green and blue water/land use planning	✗	✗	✓	✗
Financing	✓	✗	✗	✗
Enforcement/regulation (self- versus third-party enforcement)	✗	✓	✓	✗
Mechanisms for dispute resolution	✗	✗	✓	✗

Notes: ✗, not clear/uncertain; ✓, clearly reflected; EPE, Environmental Policy of Ethiopia; LULA, Land Use and Land Administration Policy; WSG, Watershed Management Guideline; WRMP, Water Resources Management Policy/Regulation/Guideline.

Source: Hagos *et al.*, 2011

management to be compatible and integrated with other natural resources as well as river basin development plans. In practice, however, some of the policies are not coherent and coordination between sectors to realize such integration is loose (Hagos *et al.*, 2011 Hussein *et al.*, 2009). The states have a stronger power to administer land in their regions; however, administration of water (particularly of the international regions and those rivers crossing two or more regions) is an issue of the federal states, which manifests a lack of integrated approaches in practice. The weak status of integrated approaches can also be realized from a lack of land use planning and rainwater management in the policy element, which is an interface between different elements of integrated approaches (Table 13.3). This is particularly true for parts of the downstream where the key policy focus is blue water management (Hussein *et al.*, 2009).

Typology of essential policy instruments

There are different types of policy instruments and approaches to internalize externalities (Kerr *et al.*, 2007), which include regulatory limits, taxes on negative externalities, tradable environmental allowances, indirect incentives, payment for environmental services, etc. These instruments could be broadly classified into economic, market-based, and command-and-control instruments. For example, administrative and legal measures against offenders, technology standards, closure or relocation of any enterprise and permits in the case of hazardous waste or substances (as indicated in EPA) fall under the category of command-and-control instruments. Among the many incentive-based policy enforcement mechanisms only subsidies are mentioned in EPA.

The new proclamations on land use and land administration in the upstream have specific regulations on land use obligations of the land user. It lists a set of obligations of the land user not only to protect the land under his/her holding but also to conserve the surroundings of lands obtained as rent (CANRS, 2006, p21). Non-compliance is likely to lead to deprivation of use rights and penalty. This is mainly a command control type of instrument. As suggested in a number of empirical studies, security of tenure is a critical variable determining incentives to conserve land quality. For example, Gebreselassie *et al.* (2009) also suggested that farmers with registered plots were more likely to adopt conservation investments than those with non-registered plots. But these farmers' interest in the decision to invest in land and water management is highly correlated to farmers' asset holdings (Gebreselassie *et al.*, 2009), and this suggests the need for mechanisms to finance land and water management (Table 13.4).

Similarly, in Sudan, land tenure is a complicated issue. The overwhelming majority of farmers in the irrigated sub-sector are tenants without recognized rights over their landholdings. A tenant has no freedom in trading his tenancy. He cannot, for example, use his tenancy as a collateral security for bank loans. Nor has he the leisure of choosing the crops that suit him. The Gezira Scheme Act of 2005 tried to address these and other land-tenure issues by giving the farmers, among other things, the freedom of choosing the crops to grow and to gradually shift from land tenancy to landownership.

Incentive-based enforcement mechanisms are lacking in the water resources policy document in both upstream and downstream parts. Those mentioned (e.g. cost- and benefit-sharing) are not implemented. For example, the water policy of Ethiopia has specific stipulations

Table 13.4 Typology of policy instruments in environmental management

Policy instruments	*WSG*	*LULA*	*WRMP*	*EPE*	*Responsible*
Information and education	✓	✗	✗	✓	
Regulations/standards	✗	✓	✗	✓	EPA/EPLAUA
Incentive-based subsidies	✗	✓	✗	✓	EPA/EPLAUA
Taxes	✗	✗	✗	✓	
Charges/penalties	✗	✓	✗	✓	
Certification (property rights)	✗	✓	✓	✓	
Cost- and benefit-sharing	✗	✗	✓	✗	
MoWR cost recovery	✗	✗	✓	✗	MoWR
Public programmes (PSNP, FFW, CFW/free labour contribution, etc.)	✓	✗	✗	✗	MoARD/BoARD
Conflict resolution	✓	✓	✗	✗	EPLAUA/social courts

Notes: CFW, cash for work; EPA, Environmental Protection Authority; EPLAUA, Environmental Protection, Land Administration and Land Use Authority; FFW, food for work; IWSM, Integrated Watershed Management Policy; LULA, Land Use and Land Administration; MoARD, Ministry of Agriculture and Rural Development; MoWR, Ministry of Water Resources; PSNP, Productive Safety Net Program; WRMP, Water Resources Management Policy

Source: Hagos *et al.*, 2011

pertaining to tariff setting. It calls for rural tariff settings to be based on the objective of recovering operation and maintenance (O&M) costs while urban tariff structures are based on the basis of full cost recovery. Users from irrigation schemes are also required, at least, to pay to cover O&M costs (Table 13.4). The institutionalization of cost recovery schemes and tariff-setting is expected not only to generate funds for maintaining water points/schemes but also to change users' consumption behaviour (i.e. demand management).

One of the principal policy objectives of structural adjustment in Sudan is to be able to recover the cost of goods and services rendered (Hussein *et al.*, 2009). In line with this policy, the Irrigation Water Corporation, a parastatal within the MIWR, was established in the mid-1990s as a part of restructuring of the water sector to provide irrigation services to the national irrigation schemes. The corporation was supposed to levy irrigation fees for its services. Unfortunately, it could not collect enough fees to cover its operations. This led to empowering the water user associations to manage minor irrigation canals, collect irrigation fees and pay for the services rendered. But the achievement has been appraised as weak to date.

Overall, there is a tendency to focus on command-control type policies (Hagos *et al.*, 2011), but not on carefully devised incentive mechanisms for improved environmental management. Through proper incentives farmers could be motivated to conserve water, prevent soil loss and nutrient leakage, and, hence, reduce downstream externalities (e.g. payment for environmental services; Table 13.4). There is an argument that policy instruments building on command and control, like regulations and mandatory soil conservations schemes in the upstream part have limited or negative effects (Kerr *et al.*, 2007; Ekborn, 2007). There are suggestions for the increased use of positive incentives, like payment for environmental services to address land degradation problems in developing countries (Table 13.4; Ekborn, 2007). It could be argued that various forms of incentives have been provided to land users to conserve the land resources in Ethiopia and elsewhere in eastern Africa. However, most of the incentives were aimed at mitigating the effects of the direct causes of land degradation. The underlying causes of land degradation remained largely unaddressed. Hence, there is a need to carefully assess whether the proposed policy instruments address incentive problems of actors, form improved environmental management and whether those selected instruments must be realistic and their formulation must involve the community.

Determinants of adoption of improved land and water management practices in the BNB: policy and institutional implication for out-scaling of good practices?

States of land and water management today: Is adoption sufficient and diverse?

The major reason for the poor performance of agriculture in many countries of sub-Saharan Africa is the deterioration of the natural resource base. Soil erosion and resultant nutrient depletion are reported as two of the triggers of dwindling agricultural productivity in the BNB (Haileslassie *et al.*, 2005). The problem is severe, mainly, on the highlands where rain-fed agriculture constitutes the main source of livelihood of the people. There are also off-site impacts: sedimentation of wetlands, pollution of water and flooding of the downstream. This raises a concern on the sustainability of recent development initiatives for irrigation and hydropower development in the BNB.

As a countermeasure, various land and water management programmes have been undergoing for decades. A range of watershed management practices have been introduced at different landscapes; for example, these include physical soil conservation measures, water harvesting, and soil fertility management (MoARD, 2005). However, the trends hitherto show that these efforts have had limited success in addressing these problems. Among others, poor adoption and transitory use of conservation techniques are often mentioned as the major factors (Shiferaw and Holden, 1998).

From an upstream case study of BNB, Gebreselassie *et al.* (2009) demonstrated that farmers are focusing more on short-term gain than on long-term investment in land and water management (Table 13.5). Technologies with immediate productivity-enhancing effects take priority in farmers' decisions. The most widely used long-term improved soil conservation technologies were soil and stone bunds (Table 13.6). This suggests that there is a widespread use of a few technologies despite the recommendations based on agro-ecological and landscape suitability (MoARD, 2005). Some of the technologies introduced to the smaller watersheds in the BNB could not be diffused into the community practice. It is understood that wider adoption of these policy and institutional factors is limited.

Table 13.5 Proportion of sample farm households and farm plots by type of regular agronomic practices used in the Blue Nile Basin

	Upstream		*Downstream*		*Households*		*Farm plots*	
	Number	*%*	*Number*	*%*	*Number*	*%*	*Number*	*%*
Manuring	136	22.86	134	18.21	239	73.5	294	19.8
Composting	93	15.63	66	8.97	120	36.9	169	11.4
Counter ploughing	315	53.03	308	41.85	186	57.2	649	43.6
Strip cropping	21	3.54	59	8.02	65	20.0	96	6.5
Intercropping	54	9.09	58	7.89	90	27.7	131	8.8
Crop rotation with legumes	497	83.81	590	80.38	315	96.9	1194	80.3
Fallowing	6	1.01	13	1.77	11	3.4	19	1.3
Mulching and crop residue management	–	–	2	0.27	5	1.5	5	0.3
Relay cropping	–	–	1	0.14	1	0.3	1	0.1
Alley cropping	–	–	1	0.14	1	0.3	1	0.1
Use of Broad Bed Maker to drain water	8	1.65	1	0.14	3	0.9	9	0.6
Reduced tillage/no tillage	52	8.77	87	11.84	36	11.1	139	9.3
Inorganic fertilizer application	228	38.15	339	46.06	211	64.9	652	43.8

Source: Gebreselassie et al., 2009

Conserving land and water in the BNB: what limits adoption of improved land and water management practices?

The number of policy- and institution-related factors are mentioned as determinants of adoption of improved land and water management (Gebremedhin and Swinton, 2003). In this regard, an example of farmers' adoption of improved land and water management practices was studied upstream of the BNB by Gebreselassie *et al.*, (2009). Using econometric modelling

Table 13.6 Number of households and farm plots by type of long-term soil and water conservation structures used in the Blue Nile Basin

Type of structure	*Upstream*		*Downstream*		*Households*		*Farm plots*	
	Number	*%*	*Number*	*%*	*Number*	*%*	*Number*	*%*
Stone bund	146	50.52	92	34.85	114	44.0	238	43.0
Soil bunds	127	43.94	158	59.85	157	60.6	285	51.5
Bench terraces	5	1.73	–	–	4	1.5	5	0.9
Grass strips	1	0.35	–	–	1	0.4	1	0.2
Fanya Juu	8	2.77	–	–	5	1.9	8	1.5
Vegetative fence	–	–	2	0.76	1	0.4	2	0.4
Multi-storey gardening	–	–	6	2.27	5	1.9	6	1.1
Life check dam	–	–	4	1.52	4	1.5	4	0.7
Tree planting	2	0.69	2	0.76	4	1.5	4	0.7

Source: Gebreselassie *et al.*, 2009

tools, they demonstrated that land tenure security increases the probability of adoption significantly. Farmers with registered plots were more likely to adopt the conservation investments than those with the non-registered plots. Other empirical studies (e.g. Gebremedhin and Swinton, 2003) also show that security of tenure is a critical variable determining incentives to conserve land quality. A secured land-tenure right reinforces private incentives to make long-term investments in soil conservation.

Although access to market is perceived as one of the major determinants to farmers' adoption of land and water management technologies, Gebreselassie *et al.* (2009) suggested that this can be site-specific and depends on the return farmers are expecting from such investment. They suggested that households allot their labour to non-conservation activities in case returns from agriculture are not significantly higher than those from non-farm employment. This calls for incentive mechanisms emphasized in the preceding section. Particularly, market-based incentive mechanisms, such as eco-labelling and taxes and subsidies, can enhance farmers' adoption of improved land and water management techniques.

Plot characteristics such as plot area, slope, soil type and fertility are factors that significantly affect farmers' adoption decisions (Pender and Kerr, 1998; Pender and Gebremedhin, 2007; Gebreselassie *et al.*, 2009). Plot area has relatively the most vivid effect on the probability of farmers' decision to adopt land and water management techniques: with one unit increase in the area of plot, the probability of a farmers' decision to use land and water management practices increased 2.2 times. The most commonly adopted physical soil and water conservation practices in the area, stone bund and soil bund, occupy space and this reduces the actual area under crops. Thus farmers with larger plot areas are more likely to adopt these practices given the technological requirement for space. Slope of the land increases the adoption decision implying that flat land is less likely to be targeted for conservation. Shiferaw and Holden (1998) noted the importance of technology-specific attributes and land-quality differentials in shaping conservation decisions. Therefore, the findings of these case studies call for policy measures against land fragmentation (e.g. minimum plot size) and promotion of technology specific to land size and quality.

Factors that determine the decision to adopt improved land and water management technologies may not necessarily determine the intensity of use. The degree of intensification is a good indicator for the scale of adoption. Therefore, those variables that explain both adoption and intensification can give better ideas where policy and institutions related to improved land and water management should focus to increase adoption and intensification. In this regard, Gebreselassie *et al.* (2009) concluded that plot area, tenure security, walking distance to output markets and location in relation to access to extension services influence both farmers' decision and intensity of adoption.

Payment for environmental services in the BNB: prospects and limitations

Payment for environmental services (PES) is a paradigm to finance conservation programmes. PES implies that users of environmental services compensate people and organizations that provide them (Stefano, 2006; Wunder, 2005). PES principles within watersheds and basins imply that downstream farm households and other water users are 'willing to compensate' upstream ecosystem service providers. The institutional analyses for BNB have illustrated that PES as an alternative policy tool for improved land and water management has received little attention. The question here is whether PES can better motivate upstream and downstream stakeholders to manage their water and land for greater sustainability and benefits for all.

Willingness to pay: opportunities and challenges

The key to the successful implementation of PES schemes lies in the motivation and attitudes of individual farmers and government policies that would provide incentives to farmers to manage their natural resources efficiently. In this regard, an example of farmers' willingness to pay (WTP), in cash and labour for improved ecosystem services, was studied by Alemayehu *et al.*, (2008) in the upstream of the BNB (Koga and Gumera watersheds, Ethiopia). The authors reported the downstream users' willingness to compensate the upstream users for continuing land and water management. The upstream users were also willing to pay for land and water conservation and, in fact, rarely expect compensation for what they do, as minimizing the on-site costs of land degradation is critical for their livelihood. The authors reported a stronger magnitude of farmers' WTP in labour for improved land and water management compared with cash and a significantly higher mean willingness to pay (MWTP) by downstream users (Table 13.7). These differences in MWTP, between upstream and downstream, can be accounted for by the discrepancy of benefits that can be generated from such intervention (e.g. direct benefits from irrigation schemes, reduced flood damages, etc.) and also from the differences in resources holdings between the two groups, and PES is widely supported as one of the promising mechanism for transfer of resources.

Table 13.7 Farmers' willingness to pay for ecosystem services, in cash and labour units (Koga and Gumera watersheds, Blue Nile Basin, Ethiopia)

	Upstream		*Downstream*		*Total*	
	Willing	*Not willing*	*Willing*	*Not willing*	*Willing*	*Not willing*
WTP (number of respondents)	99	76	112	38	211	114
WTP (labour PD month $^{-1}$)	169	6	147	3	316	9

Notes: PD, person-days; WTP, willingness to pay

Source: Alemayehu *et al.*, 2008

Farmers' willingness to pay in labour was twofold higher compared to their willingness to pay in cash. This implies that farmers are willing to invest in improved environmental services but that they are obstructed by the low level of income and lack of institution and policy that consider PES as an alternative policy instrument. Here, the major point of concern is also whether these farmers' contribution (either in cash or labour) is adequate for investment and maintenance costs of conservation structures and, if this is not the case, what the policy and institutional options to fill the gaps could be.

As indicated in Table 13.8, the average labour contributions for upstream and downstream farmers were 3.3 and 3.9 PD month^{-1}, respectively; whereas the average cash contributions of the upstream and downstream farmers were 10.4 and 13.1 Ethiopian birr (ETB) month^{-1}, respectively. The MoWR (2002) reported an estimated watershed management cost of 9216 ETB (US$760) ha^{-1}. Taking mean current landholding per household and inflation since the time of estimate into account, a farm householder may require about 13,104 ETB (US$1,365) ha^{-1} to implement improved land and water management on his plots. From this it is apparent that the general public in the two watersheds are willing to pay for cost of activities to restore ecosystem services, although this amount is substantially less than the estimated costs. This trend could be argued from the point of view of Stefanie *et al.* (2008), who illustrated that PES is based on the beneficiary-pays rather than the polluter-pays principle, and as such is attractive in settings where environmental service providers are poor, marginalized landholders or powerful groups of actors. The authors also make a distinction within PES between user-financed and PES in which the buyers are the users of the environmental services and government-financed PES in which the buyers are others (typically the government) acting on behalf of environmental service users. In view of these points it can be concluded that implementation of PES can be an opportunity in BNB but will require the coordinated effort of all stakeholders including the governments, and the upstream and downstream communities.

Table 13.8 Estimated mean willingness to pay for ecosystem services in cash and labour units (Koga and Gumera watersheds, Blue Nile Basin, Ethiopia)

MWTP	*n*	*Mean value*	*CI (95%)*	*p > t*
MWTP in ETB month^{-1} (upstream)	175	10.4	8.2–12.6	0.0029
MWTP in ETB month^{-1} (downstream)	150	13.1	11.8–14.5	
MWTP in labour PD month^{-1} (upstream)	175	3.3	3.15–3.40	0.0000
MWTP in labour PD month^{-1} (downstream)	150	3.9	3.69–4.01	

Notes: CI, confidence interval; ETB, Ethiopian birr, where US$1 = ETB 9.6; MWTP, mean willingness to pay; PD, person-days

Source: Alemayehu *et al.*, 2008

Overall conclusions and policy recommendations

This chapter explored the set-up and gaps of land and water management policy and institutions in the BNB. It identified determinants and intensity of adoption for improved land and water management practices and its implications for institutions and policy interventions and it assessed also mechanisms for basin- and local-level upstream and downstream community cooperation by taking payment for environmental services as an example.

Despite decades of efforts to improve land and water management in the BNB, achievements made are negligible to date. This is accounted for by the fact that farmers' conservation decision and intensity of use of improved land and water management are influenced by a number of policy and institutional factors. Some of these factors are related to access to resources while others are related to policy incentive (e.g. access to market, payment for environmental services, benefit-sharing, and property right), appropriateness of technology (e.g. lack of niche-level technology), the way organizations are arranged, and their weak enforcement capacity.

The question is whether addressing these policy and institutional issues only at local/country level would be effective at the basin level. The agrarian-based livelihood in the basin is operating within the same hydrological boundary. This also means policy measures that respond to local needs (e.g. poverty alleviation in upstream) may affect downstream users. Therefore, while addressing local- and regional-level policy and institutional issues, mechanisms for basin-level cooperation must be sought (e.g. virtual water trade to improve market access of farmers, PES, benefit-sharing, etc.).

The findings from the PES study substantiate the hypothesis of PES as a potential policy instrument for improved land and water management and conflict resolution between upstream and downstream users. This potential must be realized to bring about a win-win scenario in the upstream and downstream of a watershed and at large in the BNB. Above all, the low magnitude of farmers' bid can be a challenge for its realization and thus a sole user-financed PES scheme may not be feasible in short terms both at the local and the basin scale. Alternatively, a PES paid by the users and government-financed PES schemes can be a strategy. The modality for government support can be part of investment in irrigation infrastructure and can be also linked to the global target of increasing soil carbon through land rehabilitation and tree plantation.

One of the critical constraints, indicated in this chapter, against effective and common river basin management is that institutions and policy frameworks do not consider upstream or downstream users. No-win outcomes are likely to occur if the current scenario of unilateral acts continues to persist. Hence, it is incumbent upon co-basin countries to go beyond that and apply a positive outcome if they opt to share the benefits coming out of water. The first step in this direction would be to establish transboundary river-basin institutions which offer a platform for such an engagement. However, the virtue of establishing such an institutional architecture may not guarantee the success of cooperative action. Benefits, costs and information have to be continuously shared among the different stakeholders within the country and between countries in order to build trust and confidence. The latter is not an event, but rather a process that should be continuous and built on an iterative procedure.

References

Alemayehu, B., Hagos, F., Haileselassie, A., Mapedza, E., Gebreselasse, S., Bekele, S. and Peden, D. (2008) Payment for environmental service (PES) for improved land and water management: the case of Koga and Gumara watersheds of the BNB, Ethiopia, in *Proceedings of CPWF Second International Workshop November 2008, Addis Ababa, Ethiopia*, Challenge Program on Water and Food, CGIAR, Washington, DC

Bandaragoda, D. J. (2000) *A Framework for Institutional Analysis for Water Resources Management in a River Basin Context*, IWMI Working Paper 5, International Water Management Institute, Colombo, Sri Lanka

CANRS (Council of Amhara National Regional State) (2006) The Revised Amhara National Regional State

Rural Land Administration and Use, Proclamation No. 133/2006, Zikre Hig, 11th year, no 18, 29 May, CANRS, Bahir Dar, Ethiopia

Ekborn, A. (2007) Economic Analysis of Agricultural Production, Soil Capital and Land Use in Kenay, PhD thesis, Department of Economics, University of Gothenburg, Sweden

FDRE (Federal Democratic Republic of Ethiopia) (1997) *Environmental Policy of Ethiopia*, Environmental Protection Authority in collaboration with the Ministry of Economic Development and Cooperation, Addis Ababa, Ethiopia

Gebremedhin, B. and Swinton, S. M. (2003) Investment in soil conservation in Northern Ethiopia: the role of land tenure security and public programs, *Agricultural Economics*, 29, 69–84

Gebreselassie, S., Hagos, F., Haileslassie, A., Bekele S.A., Peden, D. and Tafesse, T. (2009) *Determinants of Adoption of Improved Land and Water Management Practices in the BNB: Exploring Strategies for Outscaling of Promising Technologies*, Proceedings of the 10th Conference of the Ethiopian Society of Soil Science (ESSS), 25–27 March 2009, EIAR, Addis Ababa, Ethiopia

Hagos, F., Haileslassie, A., Bekele, S., Mapedza, E. and Taffesse T. (2011) Land and water institutions in the BNB: setups and gaps for improved land and water management, *Review of Policy Research*, 28, 149–170

Haileslassie, A., Priess, J., Veldkamp, E., Teketay, D. and Lesschen, J. P. (2005) Assessment of soil nutrient depletion and its spatial variability on smallholders' mixed farming systems in Ethiopia using partial versus full nutrient balances, *Agriculture, Ecosystems and Environment*, 108, 1, 1–16

Haileslassie, A., Hagos, F., Mapedza, E., Sadoff, C., Bekele, S., Gebreselassie, S. and Peden, D. (2009) *Institutional Settings and Livelihood Strategies in the BNB: Implications for Upstream/Downstream Linkages*, IWMI Working Paper 132, International Water Management Institute, Colombo, Sri Lanka

Hussein, A., Abdelsalam, S. A., Khalil, A. and El Medani, A. (2009) *Assessment of Water and Land Policies and Institutions in the BNB, Sudan*, unpublished report from Improved Land and Water Management in The Ethiopian Highlands: Its Impact on Downstream Stakeholders Dependent on the Blue Nile project, International Water Management Institute (IWMI), Addis Ababa, Ethiopia

Kerr, J., Milne, G., Chhotray, V., Baumann, P. and James, A. J. (2007) Managing watershed externalities in India: Theory and practice, *Environmental, Development and Sustainability*, 9, 263–281

Mapedza, E., Haileselassie, A., Hagos, F., McCartney, M., Bekele, S. and Tafesse, T. (2008) Transboundary water governance institutional architecture: reflections from Ethiopia and Sudan, in *Proceedings of CPWF Second International Workshop November 2008, Addis Ababa, Ethiopia*, Challenge Program on Water and Food, CGIAR, Washington, DC

MoARD (Ministry of Agriculture and Rural Development) (2005) *Community Based Participatory Watershed Development: A Guideline*, Ministry of Agriculture and Rural Development, Addis Ababa, Ethiopia

MoWR (Ministry of Water Resources) (1999) *Water Resources Management Policy*, Ministry of Water Resources, Addis Ababa, Ethiopia

MoWR (2002) *Assessment and Monitoring of Erosion and Sedimentation Problems in Ethiopia*, final report V, MoWR/Hydrology Department, Addis Ababa, Ethiopia

NBI (Nile Basin Initiative) (2006) *Baseline and Needs Assessment of National Water Policies of the Nile Basin Countries, A Regional Synthesis*, Shared Vision Program, Water Resources Planning and Management Project, NBI, Addis Ababa, Ethiopia

Pender, J. and Gebremedhin, B. (2007) Determinants of agricultural and land management practices and impacts on crop production and household income in the highlands of Tigray, Ethiopia, *Journal of African Economics*, 17, 3, 395–450

Pender, J. and Kerr, J. (1998) Determinants of farmers' indigenous soil and water conservation investments in semi-arid India, *Agricultural Economics*, 19, 113–125

Shiferaw, S. and Holden, S. T. (1998) Resource degradation and adoption of land conserving technologies in the Ethiopian highlands: a case study in Andit Tid, North Shewa, *Agricultural Economics*, 18, 233–247

Stefanie, E., Stefano, P. and Sven, W. (2008) Designing payments for environmental services in theory and practice: an overview of the issues, *Ecological Economics*, 65, 663–674

Stefano, P. (2006) *Payments for Environmental Services: An Introduction*, Environment Department, World Bank, Washington, DC

Wunder, S. (2005) *Payments for Environmental Services: Some Nuts and Bolts*, Occasional Paper no 42, Center for International Forestry Research (CIFOR), Jakarta, Indonesia