



Baro-Akobo River Basin Wetlands: Livelihoods and Sustainable Regional Land Management (Ethiopia)

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Abstract

The Baro-Akobo system from Ethiopia, along with a major tributary the Sobat from South Sudan, contributes 48% of the flow of the White Nile where these river systems join downstream of Malakal. Within the Baro-Akobo system in Ethiopia there are wetlands at altitudes from 400 m amsl to over 2,000 m, varying in size from 1 ha to more than 1,000 ha. These wetlands provide a range of ecosystem services and play critical roles in the livelihoods of the local people.

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These communities have built up considerable local knowledge about these areas and have developed community management systems. These skills need to be developed and applied more rigorously to address the threats to wetlands to ensure sustainable use with catchment and wetlands managed together in a functional landscape approach.

Keywords

Livelihoods · Sustainable wetland management · Local knowledge · Community institutions · Functional landscape approach · Valley bottom wetlands · Floodplains · Ethiopia

Introduction

The Baro-Akobo system, flowing into the White Nile, covers some 76,000 km² in Ethiopia. It had a population of 2.4 million in 2000. The Baro and Akobo rivers originate in the highlands of southwest Ethiopia and flow west into the Sudan. Joined by Sobat in South Sudan these rivers together contribute 48% of the flow of the White Nile where these river systems join downstream of Malakal (Sutcliffe 2006a).

The Baro-Akobo basin within Ethiopia is almost equally divided between highlands (58%) and lowlands (42%). The highlands are mostly between 1,500 and 2,500 m amsl, while the lowlands are a gently sloping plain mostly between 400 and 500 m amsl. A major escarpment separates the two areas. In the highlands the predominant vegetation is Afromontane forest. In the lowlands the vegetation grades from *Acacia seyal* to *Balanites aegyptiaca* savanna woodland in east through grassland to seasonal wetlands and swamps in the west. Rainfall in the highlands is over 2,000 mm over a rainy season of 10 months, while in the lowlands it is around 600 mm. The population is concentrated in the highlands (ca. 80%), while the lowland part of the basin is sparsely populated (Sutcliffe 2006b).

The wetlands in this basin vary in character, those in the highlands being mostly quite small valley bottom features, while in the lowlands they are much more extensive floodplains supplied by river overspill. These wetlands play important roles in rural livelihoods, and the sound management of the wetlands is an important element in the development of an ecologically sensitive and sustainable use regime for this basin.

Highland Wetlands**Extent and Character**

Within the highland portion of the basin there are concentrations of permanent and semipermanent wetlands. They vary in size from less than 1 ha to over 20 ha, with a few reaching 1,000 ha. *Cyperus latifolius* is the dominant vegetation in these wetlands. Most of these wetlands are in the mid-altitude plateau areas, between

Table 1 Wetland uses and beneficiaries in Illubabor Zone

Uses	Estimate of households benefiting
Social/ceremonial use of sedges	100% (including urban dwellers)
Thatching reeds	85% (most rural households)
Temporary crop guarding huts of sedges	30%
Dry season grazing	Most cattle owners (30% of population)
Water for stock	Most cattle owners (30% of population)
Cultivation	25%
Domestic water from springs	50–100%
Craft materials (palm products and sedges)	5%
Medicinal plants	100% (mostly indirectly by purchase from collectors/traditional doctors)

Source: Wood and Dixon (2002), with permission of author

1,600 and 2,400 m amsl, in the northern part of the basin in Western Wellega and Illubabor Zones. In Illubabor, wetlands cover between 2% and 4% of the area. Many of these permanent wetlands seem to be the result of blocked or impeded drainage and have considerable depths of silt deposits. Water depth is up to 2 m at the height of the flood but generally less, and often there is no standing water in the smaller ones in the dry season (Wood and Dixon 2002).

To the south of Illubabor, in the higher altitude interfluves between the Baro and Akobo drainage basins there are fewer wetlands, but in the far south, in the Akobo basin of Bench Maji zone, there are small floodplain wetlands in the lower mid-altitude zone, around 1,300 m amsl, where stream gradients are low.

Local Use and Knowledge

These highland wetlands play a critical role in the lives of many communities providing a range of ecosystem services (ESS). Springs around wetland edges are sources of drinking water, while wetlands provide sedges which are used for thatching, craft work, and floor covering on holidays (Table 1). Wetlands are also used throughout the highlands for the grazing of cattle, and cultivation is increasingly common.

In Bench Maji zone, wetlands are used for the cultivation of taro *Colocasia esculenta* in small floodplains. While traditionally this does not involve water management, such management is developing now farmers have realized that yields can be increased when flooding is extended (Sutcliffe 2006b). In Illubabor and Western Wellega, dry season cultivation of maize using drainage of permanent wetlands is common and long standing, being known as “bonee.” Records of such cultivation go back to the mid-nineteenth century (McCann 1995). It seems these areas have been cultivated in the past when population density was high in the area, while the recent development of urban markets, pressure from government food

security campaigns, and a serious decline in upland harvests, due to land degradation in some places, have stimulated more intensive wetland use (Wood et al. 2001). In Western Wellega because of the upland degradation wetlands account for 70% of the grain produced in some communities, while more commonly between 10% and 20% of the domestic food production comes from these areas. However, the timing of these harvests, as the hungry season approaches, makes such food particularly valuable (Dixon and Wood 2003).

Cultivation of wetlands, when drainage is involved, is not easy, and there has been extensive, and in some areas complete, loss of wetlands in the southwest highlands of Ethiopia, these areas remaining now as rough grazing (Wood and Dixon 2008). Wetland degradation is often caused by overdrainage, damage to the “plug” which has blocked the valley, intensive cattle grazing, and degradation of the catchment which reduces water storage and leads to sediment deposition in wetlands (Dixon and Wood 2003).

Not all wetlands are degraded once cultivation starts, and some have been cultivated sustainably for several decades. In fact a body of knowledge about wetland drainage, hydrological management, and soil fertility maintenance has been built up in this area (Dixon 2003). Farmers have learnt that a rotation with fallowing can help maintain the cultivation and other benefits from these areas, with the return of sedge vegetation a good indicator of recovery (Dixon and Wood 2003). In addition, during times of cultivation drain blocking in the rainy season helps recreate the natural flooding and sediment deposition which helps maintain soil fertility, while maintaining wetland patches within wetlands can also help maintain the wetland ecosystem services of these areas.

Increasingly the link between catchments and wetlands has been recognized through the work of the Ethiopian Wetlands Research Programme (EWRP) and a local NGO – Ethio Wetlands and Natural Resources Association (EWNRA). A combination of biological and physical soil conservation work in the catchments has had a combined effect of increasing upland crop yields by more than 30%, so reducing the demand to cultivate in wetlands, and apparently increasing infiltration in the catchment and the year round supply of water to the wetlands. Such measures have been so successful that some wetlands which had suffered degradation are now permanently flooded and no longer used for cultivation or grazing (PHE 2012).

Community-Based Management, Institutions, and Sustainable Wetland Use

One key to sustainable wetland management is the existence of community-based institutions which coordinate wetland management (Dixon et al. 2013). Such organizations are essential given the way in which land management within a wetland is linked through hydrological processes and other ESS. In the highlands of Southwest Ethiopia, the post of Abba Laga, “father of the water,” has existed among the Oromo people for managing wetland areas, while more recently the government has supported communities to develop their own committees for managing wetland

use. Such bodies coordinate drainage and plowing and also play a role in organizing guarding of the crops from pests such as monkeys and wild pigs (Dixon et al. 2009).

Lowland Wetlands

Extent and Character

Wetlands cover 2,372 km² of the lowland portion of the Baro-Akobo basin within Ethiopia, this being 3.5% of the basin. These wetlands are both permanent and seasonal in nature, being fed by overspill from the Baro and Akobo rivers and their tributaries. Three types of swamp are found in these lowlands: (a) *Cyperus papyrus* swamp, (b) *Typha domingensis* swamp, and (c) *Vosia cuspidata* swamp. The seasonally flooded areas are dominated by (a) *Oryza longistaminata* dominant and (b) *Echinochloa pyramidalis* (Sutcliffe 2006b).

The major concentration of wetlands is in the western part of the lowlands. Their complex ecological conditions make for rich and varied patterns of habitats, and they support very distinctive flora and fauna (Woube 1999). As a result a large part of this area is covered by the Gambella National Park (5061 km²). This park was proposed because of the numerous large wildlife species, particularly Nile lechwe *Kobus megaceros*, white-eared kob *K. kob*, and whale-headed stork *Balaeniceps rex*. The white-eared kob migrates every year between the Sudd in South Sudan and the Gambela marshes. Some 43 species of mammals are found in the park and an IBA team recorded 230 species of birds (EWNHS/Bird Life International 1996). The park is not legally gazetted and no management plan has been prepared. There have been major incursions into the park by the government's Akobo large-scale farm in the 1980s/1990s and by foreign investment for irrigation development after 2000.

Local Use

Two ethnic groups dominate in these lowlands, each using the wetlands in different ways. The Anuak live on the high levees along the main rivers, especially the Baro, and practice flood retreat cultivation of sorghum and maize in the adjoining wetlands. They also engage in fishing. The Nuer are agropastoralists who are based on limited higher areas in the west of the lowlands away from the tsetse belt. They graze their cattle extensively across the seasonal wetlands, migrating between the drier uplands in the rains and the seasonally flooded grassland in the dry season.

In recent years there have been reports of worsening floods in the lowlands along with lower dry season flows in the main rivers (Woube 1999; Sanne van Aarst, personal communication 2014). This has forced the relocation of some villages and increased competition for the higher settlement sites. This change in river regime is thought to be due in large part to changes in land use in the highland catchments as a result of deforestation, the expansion of cultivation, and the degradation of catchments and wetlands.

Coordination of Competing Land Use

It has been recognized that there is considerable potential for large-scale irrigated agriculture in the lowlands, mostly in the area between the Baro and the Akobo along the Alwero and Gila rivers, before they enter the wetland dominated west of the sub-basin. Estimates vary but more than 500,000 ha are reported to be suitable for crops such as cotton and rice. Dams and water control for irrigation are already altering flows in the Alwero and Gila rivers, and this will impact on the wetlands to the west.

There have been a number of conflicts between the local communities, the national park, and the investors, and this is now being addressed by a projects implemented by the Horn of Africa Regional Environment Centre and Network which seek to help communities maintain their livelihoods and improve the security of these while ensuring that the national park is redefined and demarcated in a way which will meet the needs of the animals, especially their migration patterns. Land and water management to maintain the wetlands is also a part of this project to ensure that the wetlands are recharged and so support the livelihoods of the agropastoral Nuer and the grazing and migration of the wildlife.

Threats and Future Challenges

The wetlands in both the highland and lowland parts of the Baro-Akobo basin in Ethiopia are important for the range of ecosystem services they provide, especially provisioning ones for communities, support services for biodiversity, and hydrological regulation which attenuates the flow of the rivers and moderates and maintains the flood regime in the lowlands and further downstream. In this way and through the migration of wildlife these wetlands are not just of local value but also of international importance. However, these wetlands are under increasing pressure, especially from agriculture across the basin and from water extraction and diversion in the lowlands. There is also a considerable potential for hydropower development along the escarpment which would further impact on the downstream hydrological system and wetlands but also need functioning catchments and wetlands for water storage in the highlands.

These challenges suggest two key perspectives are needed in measures to manage development in this basin and to maintain the various wetlands and maximize the range of benefits from ecosystem services.

- (a) The first is an integrated basin-wide approach which recognizes the functional linkages across the basin landscape and applies a functional landscape approach through policies and incentives to support critical land use in catchments and in wetlands which will help to maintain ecosystem services in a sustainable way, thereby benefiting people, the national economy, and biodiversity (e.g., www.wetlandaction.org/FLA, Accessed: 9 April 2016).

- (b) Secondly, with respect to wetlands specifically, there is a need for communities and planners to recognize the full range of ecosystem services which are provided by wetlands and develop the value of all of these as far as possible. In this way, through multiple use, wetlands can be managed in ways which will make them valued and competitive parts of the landscape which communities and planners will seek to maintain (Wood and Van Halsema 2008).

These perspectives should provide critical guidance for the proposed Baro-Akobo Basin Commission which it is expected will be established as part of the water resource development planning ongoing in Ethiopia today.

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