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Sustainable Utilization of Wetlands for Food Security: A Case Study of the Simulemba Traditional Authority in the Kasungu District of Malawi

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Malawi is highly vulnerable to the adverse impacts of climate change and extreme weather and has experienced numerous adverse climatic events since 1980. The most serious events have been dry spells, seasonal droughts, intense rainfall, riverine floods, and flash floods. Droughts and floods have increased in frequency, intensity, and magnitude and have adversely affected food and water security, water quality, energy, and the sustainable livelihoods of rural communities. With increased incidences of droughts and dry spells, one of the major coping and adaptation strategies emerging is wetland use.

Wetlands, locally known as *dambos* in Malawi, are defined as permanently or seasonally wet land in valleys, depressions, or floodplains with open herbaceous vegetation (mainly grasses and sedges) and no trees. They are important sources of the water and nutrients needed for biological diversity and support the livelihoods of many rural communities in developing countries. Wetlands contain numerous goods and services that have economic value not only to local populations but also to people living outside the wetland periphery. In Malawi, the total irrigable area of *dambos* is 480,000 to 600,000 ha. Upland *dambos* constitute about 70% of this area, whereas floodplains constitute about 25%.

Despite their importance, wetlands are increasingly coming under threat of modification or reclamation. Recent climate-change-associated global phenomena have brought more challenges to wetland management as rural communities have been resorting to wetland use as a coping and adaptation strategy. This paper focuses on community findings on wetland utilization for food security in the Simulemba Traditional Authority in the Kasungu District, Central Malawi. Using the Striking a Balance approach, it focuses on the differing roles of different players in communities, families, and households in wetland management. It also outlines the policies and development strategies that can turn wetlands into valuable ecosystems for food security.

Key words: Sustainable wetland use, functional landscape approach, food security

Introduction

Malawian farmers, like many in Africa, appear to be facing a bleak future in terms of ensuring the ecological and economic viability of their farms. Escalating population growth and its attendant land pressure problems are forcing farmers to abandon traditional practices of land management that previously helped to maintain their natural resource base.

In response to these problems, some Malawian farmers, with the help of government and international agencies, have already started developing new ways of managing their land resources to counteract ecological degradation. Emphasis has been directed to rehabilitating or bringing into production the marginal wetlands (*dambos*) that occur in low-lying areas of their farms and adjacent to rivers.

Farmers have always attempted to develop irrigated vegetable gardens (*dimba*) in such areas to maintain food production through the dry season.

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However, with growing pressure on land the *dambo* and *dimba* areas are suffering the same problem as the seasonal croplands, namely overuse resulting in the "mining" of environmental resources.

A number of farming communities have therefore been encouraged to consider developing a more ecological approach to managing these wetland areas; such an approach will hopefully renew the farmers' natural resource base and ensure its sustainability. In this paper we discuss community wetland utilization for food security in a case study of the Simulemba Traditional Authority (TA) in the Kasungu District of Central Malawi, where a Strike a Balance Approach is being utilized as a tool for sustainable wetland utilization and management.

Kasungu District

This paper follows the principles of the Simlemba Community Initiative for Sustainable Rural Livelihoods Project, which has been implemented by MALEZA (the Malawi Enterprise Zone Association) in Kasungu District, Central Malawi in Simulemba Traditional Authority (Fig 1 and 2). Specifically the project was implemented in 3 villages along the following wetlands i.e. Kagona Wetland, Katema Wetland and Simon Wetland. TA Simlemba is 140 km north of Lilongwe, Malawi's capital. TA Simlemba is situated in the northeastern part of Kasungu District, about 75 km from the Kasungu District headquarters. TA Simlemba is one of the most disadvantaged areas in Central Malawi. It has a population of over 29,241 and 5848 households (Ministry of Local Government, 2007).

Kasungu District is bordered by Zambia to the west, Mchinji, Dowa, and Lilongwe to the south, Mzimba to the north, and Nkhotakota and Ntchisi to the east of all the districts in Malawi, the Kasungu District has the greatest number of shared boundaries. The total area of the district is 7878 km^2, making up 8.4% of the total land area of Malawi, which is 94,276 km^2.

Kasungu has a cool to warm tropical climate. Over the year the temperature in the district ranges from 12 to 30℃. High temperatures are usually reached in September and October, whereas temperatures are low from May to July. Kasungu generally has a consistent rainfall pattern. However, in the 2004–2005 and 2005–2006 rainy seasons there was erratic rain and most areas of the district suffered dry spells. The rainy season starts in October and ends in April or May. District rainfall is high during December, January, and February. In 2006–2007 the annual rainfall Kasungu was high at 1015.8 mm, but in 2005–2006 it was only 655.9 mm, (Kasungu Social Economic Profile, 2007). The areas that were highly affected by the dry spell in 2005–06 were the Kasungu Chipala, Chamama, and Kaluluma Extension Planning Areas (EPAs). It should also be noted that these areas are heavily deforested. There are two main (Bua and the Dwangwa) and five secondary (Rusa, Lingadzi, Milenje, Luwelezi, and Lupache) rivers in the district. All these rivers drain into Lake Malawi.

Agriculture is the major economy in the District and provides work for over 80% of the people of Kasungu. Kasungu District has a total of 174,277 farming families, with an average landholding size of about 1.9 ha. Of the total area in Kasungu, 324,906 ha (41.2%) is arable land held by large estates or smallholder famers (Ministry of Local Government, 2007). Kasungu District is divided into six EPAs, namely Chulu, Kaluluma, Kasungu Chipala, Chamama, Lisasadzi, and Santhe. The major crops grown are maize, tobacco, groundnuts, cassava, and sweet potato. In the 2006–2007 seasons, maize covered almost 41.1% of the total farmland and burley tobacco covered 10.2%. (Ministry of Local government, 2007) Other crops grown include beans, millet, paprika, sunflower, sorghum, and rice. Table 1 presents (in hectares) the crops cultivated in Kasungu from the 2004–2005 to 2006–2007 seasons. Most rural farmers come from tobacco-growing backgrounds and work as tenants. Any strategic decisions made about the farming systems are tobacco or maize oriented. Large-scale tobacco farming and maize monocropping have contributed to the intense deforestation in Central Malawi. Deforestation has increased desertification and loss of soil fertility, placing future generations at increased risk of food insecurity. Deforestation, coupled with problems of erratic rainfall, declining soil fertility, and uncertainty about terms of payment from tobacco buyers, means that farmers need help in shifting toward irrigation and food production diversification that is focused more on household needs.

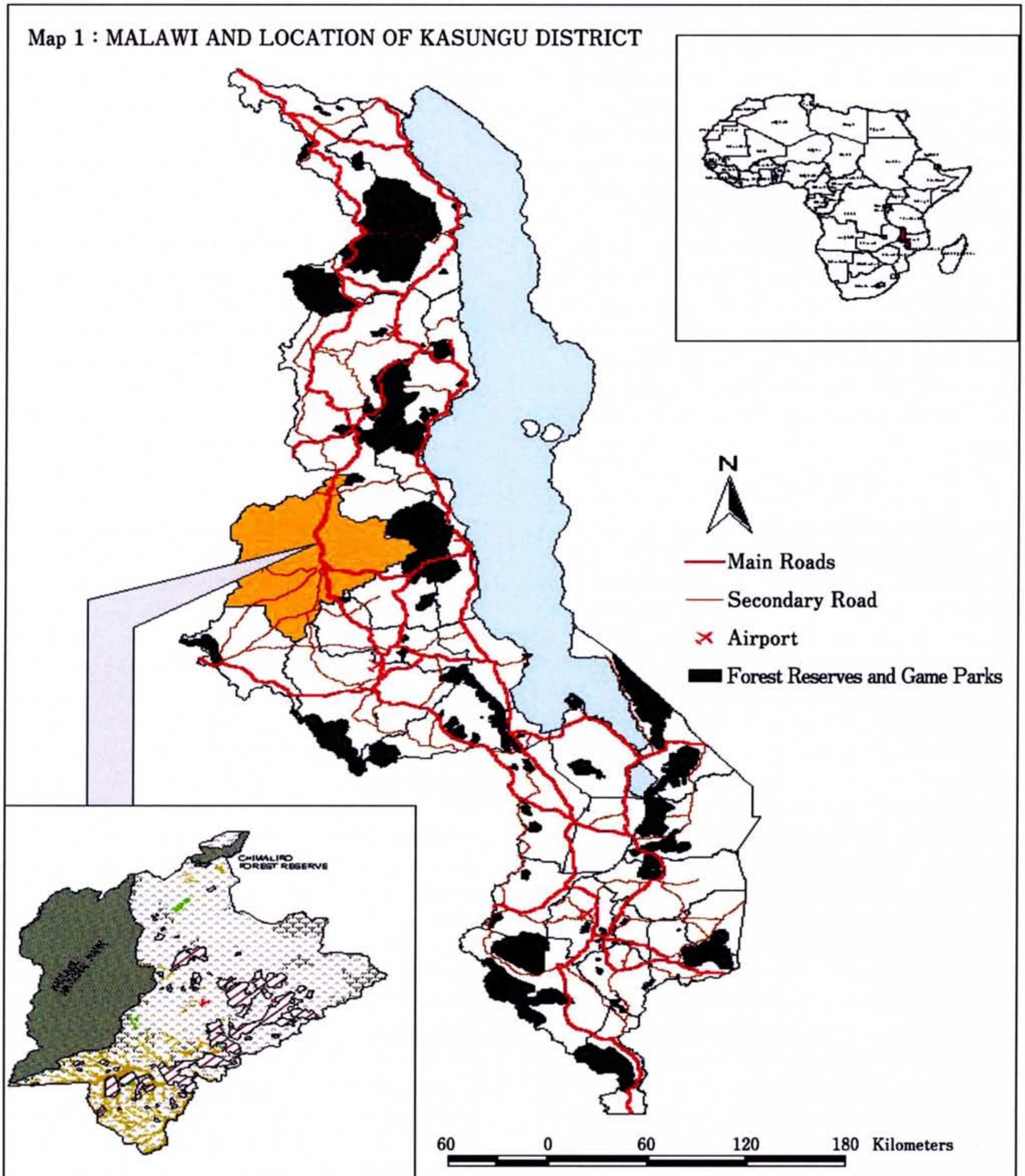

Fig. 1. Location of Kasungu District
Source: National Atlas of Malawi

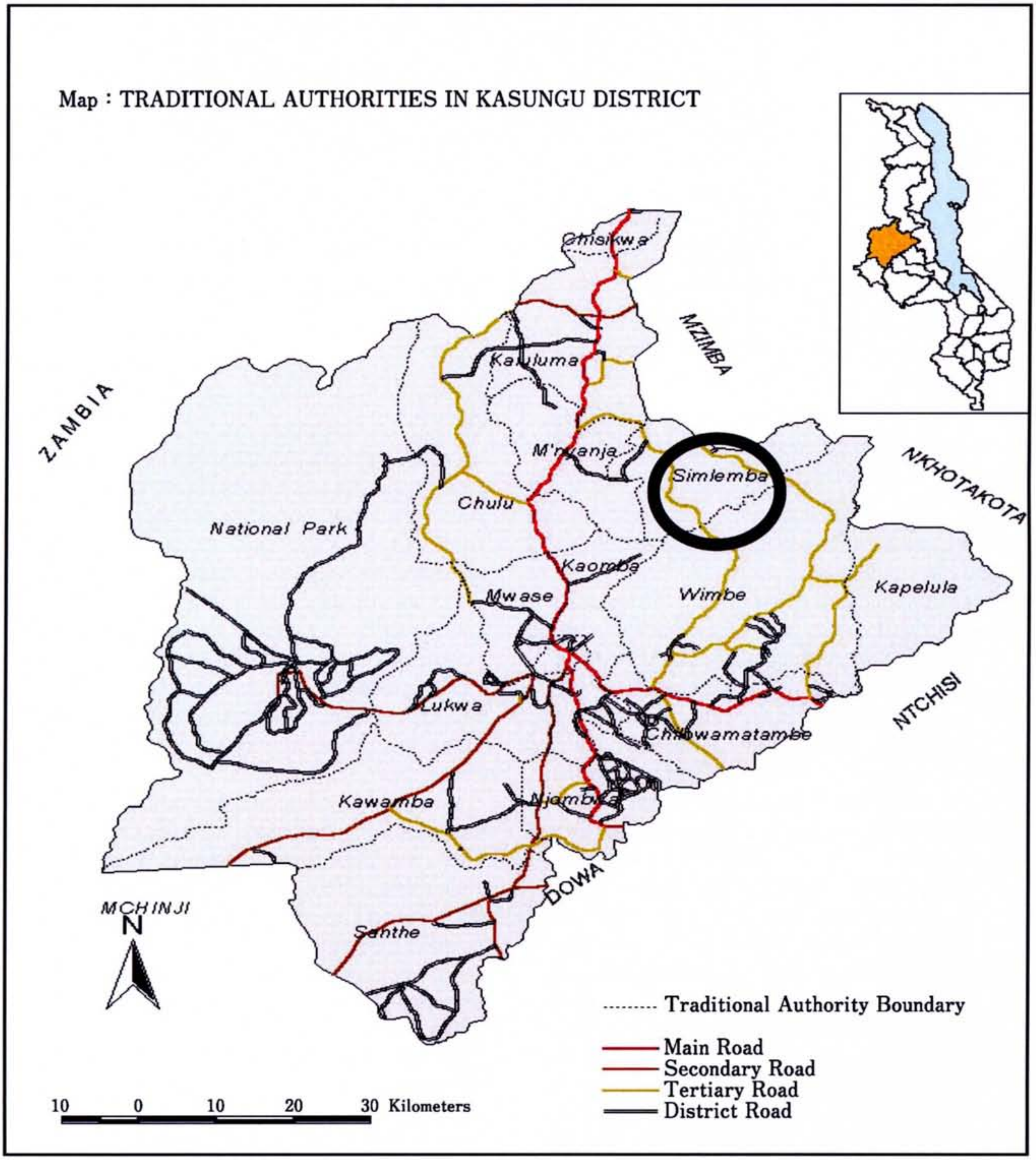

Fig. 2. Traditional Authorities in Kasungu District
Source: National Atlas of Malawi

Table 1. Production (tones), Yield (ha) Per Crop Grown

	Area cultivated (Ha)			Production (tonne)		
Crops	2004/05	2005/06	2006/07	2004/05	2005/06	2006/07
All Maize	116,038	129,154	133,651	111,391	131,312	309,598
All G/nuts	21,157	20,061	23,424	9,791	9,185	21,930
All Pulses (Beans)	32,323	30,705	33,062	17,571	9,222	15,983
Burley	18,375	15,106	13,125	9,367,598	7,928,843	12,327,792
NDDF	50	10	588	12,680	2,220	383,241
Cassava	5,882	7,113	9,150	94,936	96,721	157,893
Sweet Potato	4,835	5,355	7,181	51,217	48,825	95,343
All Rice	317	269	291	213	162	327

Source: Kasungu Social Economic Profile, 2007.

Wetlands: A New Agricultural Frontier in Malawi

Wetlands are diverse in Malawi (Table 2). For the purposes of this paper, at least four major groups can be identified:

- Lake Malawi margin wetlands - where several irrigation schemes have been developed and more are planned, especially through the Green Belt Irrigation initiative;
- Lake Chilwa, very shallow, but extensive lake (683 sq km), a Ramsar site of international importance for migratory birds, important for fishing and irrigation activities, and also affected by catchment degradation and sedimentation;
- Lower Shire, floodplain area where recent in-migration has been seen and a major expansion of wetland cultivation has been seen;
- Dambos and stream valleys seasonal wetlands, away from Lake Malawi and Shire River, where some government planned irrigation schemes have been developed, but also much small scale to micro scale irrigation development by individuals and communities, and also through projects with government, NGO and donor support.

In the context of this paper, wetlands can fit in the fourth group as (*dambos*), defined as any permanently or seasonally wet land in valleys, depressions, or floodplains with open herbaceous vegetation (mainly grasses and sedges) and with no trees (FAO, 1996) (Fig 3). In 1991-1992 the FAO Land Resources Evaluation Project estimated that, in Malawi, the total irrigable area of *dambos* was between 480,000 ha and 600,000 ha (FAO, 1996). Upland *dambos* accounted for 70% of this area, whereas floodplains constituted about 25%. Districts with large upland wetlands include Mzimba, Kasungu, Mchinji, and Dedza. Floodplains include Vwaza and Majete in the Lower Shire of Chikwawa District; Chilwa on the Phalombe Plains, covering the Phalombe, Zomba, and Machinga districts and Kazuni in Rumphi; Nkhata Bay; and Karonga. About 36% of the population in Malawi grows its produce in wetlands (National Statistics Office, 2005).

In recent decades, agricultural use of wetlands has grown in many parts of Africa so that these areas are now a new frontier for cultivation (Kambewa, 2005). This is driven in part by population growth and the degradation of long-farmed upland fields; both of these factors have led to land shortages. The pressure on wetlands has especially increased in countries, such as Malawi, that have suffered several droughts.

Wetland agriculture in Malawi uses both formal and informal irrigation. Formal irrigation encompasses government schemes that were established from the 1960s to the 1970s and self-help schemes that were constructed in the 1980s, (Kambewa, 2005) In the Lake Chilwa wetland; such schemes include Domasi, Likangala, Bimbi, Chibwana, Mikoko, and Zumulu irrigation schemes. Informal *dimba* is performed on traditional lands, especially in the dry season. The irrigated *dimbas* are found in wetlands, along the banks of streams and rivers, and in areas below small earth dams. For the pur-

Table 2. Classification and Wetlands of Malawi

Category	Examples	Comments
Riverine		
Perennial rivers	Shire, Ruo, Bua	Sections of rivers passing through protected areas (e.g. Nkhota kota Wildlife Reserve for Bua, Liwonde National Park for Shire River and Mulanje Mountain FR Ruo) are protected. In addition, cultivation along river banks is prohibited by law.
Flood plains	Northern tributaries of Rukuru River	An important habitat for 15 endemic plant species.
	Kasungu Plain and Bua River	Bua river is a breeding ground for migrating cyprimid species e.g. *Opsaridium microlepis.*
Lacustrine	Lake Malawi	Important habitat for over 800 endemic cichlids of Malawi
	Lake Chilwa	Habitat for 13 species of fish, one of which is endemic (*Oreochromis shiranus chilwae*); a Ramsar site and Man and Biosphere reserve.
Palustrine: Marshes	Vwaza Marsh	Important location for waterfowl and large mammals
	Elephant Marsh	Important location for insectivorous plant *Utricularia inflexa* var. *inflexa*; important habitat for endangered species, such as crocodiles and hippopotamus
	Ndindi Marsh	Important habitat for crocodiles and hippopotamus
Swamps	Limphasa Swamps	Has high fish diversity.
	Nkhota Kota Swamps	Rivers are breeding sites for *Opsaridium microlepis.*

Source: Malawi Fourth National Report to the Convention on Biological Diversity, 2010.

poses of this paper, *dimba*s are called wetland gardens (Fig 4) to differentiate them from those found along riverbanks. Currently, most irrigation in Malawi takes place in *dimba*s; estimates show that 123,000 ha is under informal irrigation compared with 27,000 ha under formal irrigation (Government of Malawi, 2000).

The Striking a Balance Approach

The Striking a Balance approach address widespread and growing pressures on wetlands in Malawi from agricultural and other uses. It focuses on the way in which natural resources need to be valued by communities if they are to be used sustainably. In this way, the value obtained from wetlands motivates communities to undertake man-

Fig. 3. A Typical Seasonal Wetland
Source: MALEZA 2007.

Fig. 4. Wetland cultivation (Common beans-*Phaseolus vulgaris*)

agement practices that will enhance and sustain these areas. This approach has tested innovative ways to sustainable environmental management that seeks to develop the use of wetlands for a range of livelihood purposes and add value to these areas. This is proposed as a way of encouraging sustainable management practices, rather than imposing external controls, and introducing payments to encourage people not to use the wetlands. The approach does not seek to preserve wetlands in pristine condition, as this is not feasible given the overriding need for poverty reduction.

The approach has the following application elements:

a) Developing understanding and building confidence among farmers
b) Applying technical measures to add value to wetlands and sustain their value
c) Building local institutions to strengthen wetland management
d) Influencing policies to support the farmers' perspective
e) Monitoring wetland health.

Wetland Linkages

The first challenge in achieving sustainable wetland use is to understand wetland dynamics—especially water sources and threats to ecological integrity. The Striking a Balance approach is built on farmers' knowledge of the environmental processes in the wetlands and their catchments; this knowledge includes a clear recognition of the links—in terms of water and sediment—between the catchments and the wetlands. Farmers should be able to identify various challenges to sustaining wetland use. A simple summary, which identifies the critical aspects of wetlands, stresses the importance of water inflow and water outflow, which affect water table fluctuations above or near the surface and in turn influence the ecology (i.e., plants and animals and their environmental relationships).

Beyond this, farmers need to know where the water comes from, where it goes, and how these flows are influenced by other aspects of the environment and the surroundings. This requires a landscape analysis, part of which is shown in Fig 5. Here, it is clear that what is happening in the uplands, or catchment, around a wetland affects the way the water reaches the wetland from these much larger areas. If there is good land use and land cover, water will infiltrate the soil and percolate to the subsoil before it moves slowly through the subsoil and rocks to the wetlands, valleys, and streams. If there is poor land use in the catchment, with compacted soil and little vegetation, then the rainfall will run off rapidly into the wetlands and valleys, creating flood surges that will damage the wetland and the valleys downstream. These surges may even create gullies and destroy road bridges and other infrastructure.

This rapid runoff from the catchment can also bring with it large amounts of eroded material that is deposited in the wetlands. Often it is the coarse deposited material that reduces soil quality, whereas the finer sediments, which are rich in organic matter and nutrients, are carried away in the flood. Gullies formed by rapid runoff into wetlands can cut back up a valley for many kilometers (Fig. 6). As they do this, they lower the water table in the wetland, causing the wetland to dry up and thereby reducing the water storage in the wetland sediments. This stored water would have otherwise supplied shallow wells and helped to maintain downstream flows.

Activities in wetlands also affect wetland sustainability. If all of the surface area of a wetland is altered for cultivation, then the wetland's ability to function will be greatly reduced. This is especially so if drainage occurs and the water table is lowered. However, the wetland will be less affected if cultivation is adjusted to the natural variations in the water table and only part of the wetland is cultivated. Active cultivation in the dry season, as opposed to having dormant natural vegetation, will draw

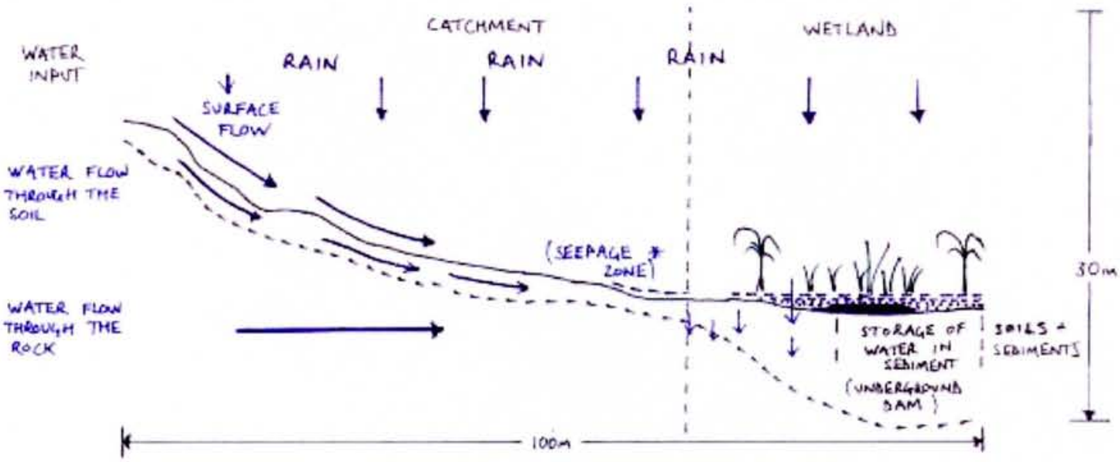

Fig. 5. Water Flows into Valleys and Wetlands
Source: Integrated Wetland & Catchment Management in Simulemba: Guidelines for Improving the Agricultural Production & Environmental Functioning of Seasonal Wetlands in Malawi, 2007.

Fig. 6. Upland degradation and gully formation

more water from the wetland, especially when irrigation is done by watering can or treadle pump. As a result, the water table will be lowered.

Some crops are especially dangerous for wetlands because of their high water demand that can dry out wetlands completely. These include eucalyptus trees and sugar cane. For similar reasons, motorized irrigation pumps can be seen as a threat to the water level in a wetland because much greater quantities of water can be extracted in this way than by using watering cans filled from a well. In some cases, use of motorized pumps can lead to the drying up of domestic water sources, such as shallow wells. Cultivation in the center of a wetland can increase the chances of gully formation, as water flows fastest in this area during the flood season. If the soil structure is disturbed here by cultivation and the natural vegetation is removed, the water flow can easily create a channel that can become a gully. In general, removal of natural vegetation to allow cultivation makes wetlands more prone to erosion, (MALEZA, 2007)

Overall, wetlands in Malawi face serious dangers —especially seasonal ones. If too much agricultural pressure is placed on wetlands from cultivation, there is a danger of undermining their ability to function as wetlands, especially in terms of their regulatory and support services of water storage, flood mitigation, and nutrient cycling. Furthermore, as wetland functioning is undermined, so too is the ability of these areas to provide provisioning services, especially cropping, as soils are affected by sediment deposition, erosion, and dropping water tables.

Technical Measures

A Functional Landscape

A functional landscape recognizes the links between catchments and wetlands and the need to adjust land use to try to support natural linkages. The approach is built on a number of concepts. A series of technical measures can be developed to increase the value derived from wetlands and sustain their functioning in tandem with livelihood development. These measures are exemplified in a land-use plan (Fig. 7) and are described below.

a) Wetland Activities

- **Wetland zoning** — Zoning can help to control the expansion of cultivation and protect

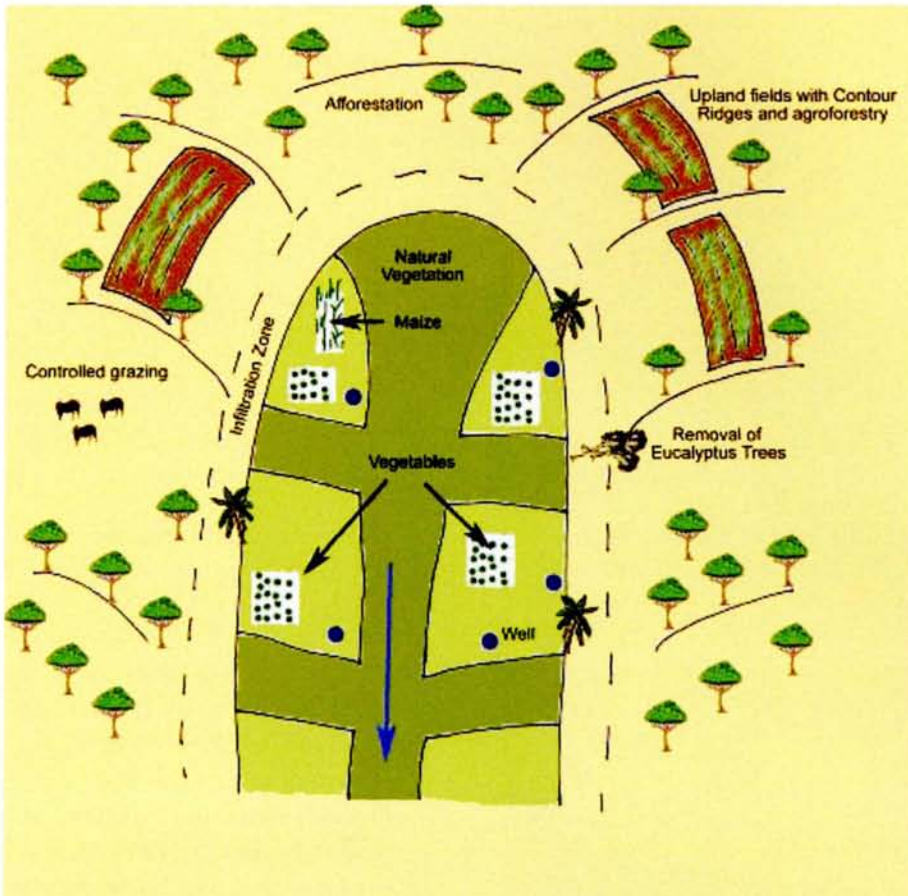

Fig. 7. Land-use Plan for Enhancing the Functional Landscape and Linking Catchments and Wetlands
Source: Integrated Wetland & Catchment Management in Simulemba: Guidelines for Improving the Agricultural Production & Environmental Functioning of Seasonal Wetlands in Malawi, 2007.

the center of the wetland where the presence of natural vegetation will help stop erosion and gully formation. Other areas of natural vegetation across the wetland may help to reduce flood surges, control erosion, and enhance infiltration. Such natural vegetation is a biodiversity reserve that provides habitat for birds and some wild animals.

- **Domestic water** — Wells, whether for domestic water or for irrigation, should not be in the center of the wetland as they can become focal points for gully formation. Ensuring that the domestic water supply is located in wells near the edge of the wetland, which can recharge the wells, helps increase the value of the wetland in the eyes of the community.
- **Water extraction and treadle pumps** — Use of watering cans for water extraction has limited impacts on the water table in a wetland. Treadle pumps, however, can have a greater impact and their use should be managed by community agreements.
- **Wetland cultivation** — Risks of erosion in wetlands due to cultivation can be reduced if cropping is restricted to small plots or beds surrounded by natural vegetation.
- **Crop cultivation** — Use of beds that are raised or lowered depending on the height of the water table can make the use of water in wetland cultivation more efficient. Plant spacing and hygiene are also important to ensure good quality crops.

b) Upland Activities

- **Conservation agriculture** — This helps to improve water infiltration and soil structure, reducing erosion and thus increasing yields. (Ministry of Agriculture, 2005)

- **Contour ridges** — These ridges can help reduce runoff and encourage infiltration of rainfall.
- **Organic compost** — Application of organic compost will improve crop yields and enhance water infiltration into the soil and storage of water in the soil. This will help crops to overcome drought.
- **Agroforestry** — Integration of tree and shrub planting with crops and livestock will help to increase water infiltration, reduce erosion, and improve soils. (Wood 2007a)
- **Afforestation** — Afforestation improves the infiltration of rainfall. This has positive effects on the wetland's water supply, reducing runoff and erosion, which can create sediment deposition in wetlands. (Wood 2007a)
- **Wetland edge buffer zones** — Adding a zone of natural vegetation to the lower edge of uplands as a buffer zone will help to prevent sediment and runoff from reaching the wetlands.

Building Local Institutions to Strengthen Wetland Management

Critical to the management of catchments and wetlands is community coordination. Access to water and land is intertwined, and there are no separate rights and obligations in regard to land and water in the wetland (Kambewa, 2005). Access to wetlands is embedded in social ties and power relations; for example, many people inherit their access rights from family members. Another example is where gardens are borrowed, mostly among family members and closest friends. This suggests that a person may be assured of having a garden as long as he or she is a member of the family that owns the wetland. (Kambewa, 2005) Moreover, certain households and village chiefs have monopolies over wetlands. What accounts for the difference in the distribution of land seems to be the interpretation given by different village chiefs and families to their rights and obligations. As far as household claims are concerned, the wetland and wetland gardens may be seen as the de facto private property of these chiefs or families. This agrees with the findings by (Mkandawire, 1992 and Government of Malawi, 2001) in regard to arable land, i.e., that when land has been allocated by the village chief, the head of the households have total control and no one can oust the users without due consultation. In fact, possession of land transcends individual lifetimes; land is held to belong to the living, the dead, and the unborn. Village heads may allocate land to individuals, their children, or any member of the extended family.

In light of these social implications, the Striking a Balance approach promotes village leadership under a selection of Village Natural Resource Management Committees (VNRMCs). These are leaders carefully selected by village leaders and other influential members in the communities. Through these institutions and the pressures that they can bring to bear upon individuals, it is possible that activities and goals that benefit the majority of the people; such as land-use planning, afforestation, reduction in the area used for growing sugar cane, and better management of treadle pump water, can be achieved.

The VNRMC helps to coordinate the use of the community's land, designating protection zones around wetlands and in the wetland's center or core. VNRMCs can produce plans, such as that below, that identify the major activities needed to improve land use and sustainable functioning of the landscape, including both catchments and wetlands. Such plans help communities to see how the various activities above are linked and contribute to a functional landscape approach. This is an interactive process; all members of the community can engage in the sustainable use of a wetland and can bring a balance that will benefit livelihoods and environmental management.

Influencing Policies to Support Farmers

Wetlands are not high on the policy-making agendas of most governments, and the organizations concerned with wetlands are often politically weak (Wood, 2007b). Given that policy making is a political process, wetland agencies need to explore first how to generate political support.

There is a tendency among wetland-related nongovernmental organizations (NGOs) to expect governments to realize the importance of, and need for, wetland policies. This is a rather assumptive that can be counterproductive. Why should governments want to develop wetland policies, which involve complex inter-agency discussions and bring conflicting views about wetlands and their values into face-to-face discussions?

It is argued that it could be more productive for those concerned with wetlands to start a dialogue with individual government agencies on a one-to-one basis (Wood, 2007b). In this way, wetland related NGO's can explore how existing policies affect wetlands and discuss, with each specific agency, ways in which negative impacts can be ameliorated. At the same time, building necessary capacity and political support for some actions on policies relating to wetlands.

The basis of this argument is practical experience, which has identified two areas of concern. First, wetlands are not seen as important in their own right by most governments and by most of their various agencies (Wood, 2007b). Recognition of wetlands is achieved only if their impact upon other aspects of society (e.g., in terms of contributing to food security, water availability, and flood control) is understood.

Second, the organizations that are pushing wetland policies in Malawi are politically unimportant (Wood, 2007b). These organizations have little or no political influence and generally cannot generate much public or government interest in their wetland concerns. This second point links to an essential understanding, which must be central to any policy discussion, that policy making is a political process. As a result, it is only those who are important and influential in political terms who can influence policy.

To have any political influence, those concerned with wetlands have to be of use to those who have political power and must be able to provide them with useful funds or help them achieve their goals (Wood, 2007b) This is the basis of alliances that can help develop wetland policies.

The critical basis for policy discussions across the range of wetland stakeholders is the recognition that wetlands are multifunctional areas. The full range of ecosystem services and how they contribute to different aspects of ecological security and livelihood development needs to be recognized, and their values (or their replacement costs in the absence of wetlands) need to be made clear to stakeholders. To take a national wetland policy forward, there has to be something of interest and benefit for all stakeholders.

The strike a balance approach for sustainable wetland use, developed by within the Simlemba Community Initiative for Sustainable Rural Livelihoods Project, is one example where the multiple uses of wetlands is recognized. The recognition of multiple uses provides a basis for dialogue between the agencies interested in wildlife, conservation, agriculture, economic development, and water resources. In this approach, both agriculturalists and conservationists can value the protected core and transverse bands of natural vegetation in wetlands because they prevent gully formation and increase water infiltration while also providing habitat for wildlife. However, in the same way as the wildlife agency is not claiming that all wetlands need to be protected or the agriculturalists are not claiming that all wetlands should be cultivated, so the other interested agencies must not claim sole rights to wetlands. A similar multiple-use approach can be taken at a different scale in a river basin, with individual wetlands allocated to different uses depending on their characteristics and suitability for sustainable use in different ways.

Although policy making is political, this does not mean that it should be influenced only by interagency discussions at the national level. Sectoral policies at the national level should reflect, and be informed by, the needs of the local population and practical experience in rural communities. In the case of wetlands, national policies should also be informed by local understanding of catchment-wetland processes because government institutions rarely have the capacity to monitor and understand specific environment-livelihood interactions at the community level.

Local people should, therefore, be regarded as valuable resources in the policy-making process for both governments and NGOs. The ways in which VNRMCs and their associated bylaws have been established provide valuable lessons for policy makers in terms of how to adopt a holistic and sustainable approach to managing multiple-use wetlands with a range of benefits. This "scaling up" of the community-level experience to the national level is also a means of ensuring that national policy is complementary and sensitive to local, indigenous management structures. This will help ensure that policies are relevant, beneficial, and acceptable to local people. However, progress in this direction requires a serious commitment on the part of government to engage with local communities and listen to the voices of the poor and marginalized in society.

Monitoring a Wetland's Health

One important element in wetland management is the understanding of ways in which a wetland's health can be monitored (Wood, 2007c). A widely held view in that only a limited range of activities could be safely practiced in wetlands. These should be ones involving no alteration of the wetland and the harvesting of only naturally produced resources, such as fish and plant materials. This view saw agriculture as damaging to wetlands and suggested that all cultivation should be banned from these areas.

The reality today in many parts of Africa is very different. Wetlands are a new agricultural frontier and are vital for rural food security and feeding urban populations. However, wetlands are fragile ecosystems that can be seriously damaged and even permanently altered by agriculture (Wood, 2007c). A lose-lose situation can occur when the agricultural potential of wetlands is undermined and the wetlands destroyed, so that no ecosystem services—whether regulatory (environmental) or provisioning (for livelihoods)—remain. To avoid this situation it is necessary to develop a simple and widely applicable method for monitoring the status of wetlands where agriculture is occurring. This method must provide guidance on how to manage these areas sustainably and it must strike a balance between the different ecosystem services for livelihoods and the environment.

A step toward developing such a methodology was taken in the implementation of strike a balance approach and was used to study the wetland sites in Simulemba by using the WET-Health and WET-Sustainable use procedures. These procedures have been developed by a team of researchers in South Africa, (Wood 2007c). Five key components of wetland health (Table 3) were studied by the project team because of their importance in sustaining wetland functioning, as explained below.

Analysis and Recommended Responses: the Experience from Malawi

When Wetland Health method was applied in Katema, Kagona and Simon Villages in traditional authority Simulemba Malawi, the following were the major findings and recommendations. (Table 4)

Community-Based Method

Although wetland health method is usually presented in academic terms and with scoring calculations, it is also possible to simplify it, by identifying common indicators of the five major components, (Table 3) so that communities can use this method. Ideally, such a monitoring system should be developed in a participatory manner, as part of the formation of a VNRMC and its training in wetland values and dynamics. In this training, it is possible for communities to identify specific physical features relevant to their monitoring—such as gullies and the location and extent of cultivated areas—and to develop their own bylaws and guidance systems for addressing the problems revealed by their analyses, such as excessive drainage, headcut gullies, and the loss of soil organic matter.

As wetland use for agriculture increases, it is essential that communities develop their skills to monitor what is happening in their wetlands by using appropriate indicators. In this way, they can identify specific interventions to maintain the health of their wetlands and so ensure the sustainable flow of benefits and ecosystem services from these areas.

Conclusion

Use of the Striking a Balance approach has shown that, despite being fragile and liable to degradation, wetlands can be used sustainably to both generate livelihood benefits and maintain environmental functions. Utilization of wetlands does not lead to their degradation provided that the functional landscape approach is understood and applied. Indeed, use of the Strike a Balance approach has shown in Malawi Simulemba area that it is possible to enhance the livelihood benefits from wetlands—and even those from the uplands—as well as maintaining the environmental services of these areas. Furthermore, use of the Striking a Balance approach has shown in simulemba that communities can become more enthusiastic about

Table 3. Key components of wetland health

Component	Rationale	Key impacts
Hydrology	The inflows, distribution, and retention of water in a wetland is the primary influence on wetland functioning. Water affects nutrient availability and sediment fluxes and can cause water logging. These, in turn, affect the fauna and flora in a wetland.	1. Changes in volume and timing of water inputs due to human activities in the catchment upstream of the wetland. 2. Modifications within the wetland, especially by artificial drains for agriculture.
Sediment: accumulation or erosion	Wetlands generally accumulate sediment, which affects the landform in the wetland and the hydrology. Sediment retention can help maintain the wetland's on-site agricultural productivity, as well as being potentially important for downstream water users by enhancing nutrient retention. Erosion can affect water storage in wetlands, especially when gullies develop.	Human activities that remove vegetation (especially as occurs in cultivation) reduce the accumulation of sediment and expose the soil to increased erosion. Impacts are often greatest when the erosion develops into gullies.
Soil organic matter (SOM): accumulation or loss	SOM, which accumulates in the upper soil layers, makes a significant contribution to wetland functioning and productivity by enhancing water-holding capacity and cation-exchange capacity.	Cultivation and drainage lead to increased loss of SOM by reducing waterlogging, which slows down the rate of organic matter decomposition. Tillage of the soil also reduces SOM.
Nutrients: retention and internal cycling	Wetlands are generally effective in retaining and cycling nutrients, which helps maintain on-site productivity of natural vegetation and crops. It can also be important for downstream water users by enhancing nutrient retention.	Activities causing increased loss of sediments reduce nutrient retention because many nutrients are bound to sediments. The more that plant cover is interrupted, the greater the opportunities for nutrient loss through leaching.
Vegetation: growth and species composition	The composition of wetland vegetation is important in terms of biodiversity and the habitat provided for fauna. Human use of particular plant species may also have direct economic importance (e.g., for use in craft production, thatching, livestock grazing, foods, and medicines).	Cultivation and other means of land clearance have the greatest direct impacts on vegetation. Impacts may also be indirect by lowering the water table and causing loss of SOM and nutrients.

Source: Striking a Balance: Ecological Assessment of Wetland Health to Guide Sustainable Use. Policy Briefing Notes 3. 2007.

Table 4. Table 4 Key Findings and Recommendation on the Situation of Wetlands in Simulemba Area

Component	Key Findings
a) Hydrology - wetland drainage	• The drains are too extensive at one Simon wetland; the high density of deep drains is having a significant impact on groundwater. • The resultant lowering of the water table by drainage affects the soil organic matter content. • A disruption in hydrological functioning could lead to erosion and gully formation. • Drainage of water should be controlled and the central part of the wetland maintained in its natural state to protect the hydrological core.
b) Vegetation - water-hungry plants	• Areas of sugar cane are too extensive in two wetlands, and at one site there are eucalyptus trees in the wetland. • These plants should be controlled where water is scarce as they can cause wetlands to dry out.
c) Natural vegetation	• Cultivation is too extensive in one wetland, with cultivation up to the center threatening the integrity of vegetation and creating erosion risks. • The center and head of the wetlands should be maintained under natural vegetation to ensure wetland integrity and prevent erosion.
d) Sediment retention/erosion	• Gullying is occurring as a result of human disturbance; this may extend to the center of the wetlands. • Rehabilitation measures are required to stabilize the eroding gully head and reduce the level of human disturbance.
e) Erosion risks	• Erosion was seen around some shallow wells in the centers of the wetlands.
f)	• Wells should be relocated out of the areas of fast water flow to prevent them from becoming sources of erosion and gully formation.
g) Soil organic matter and nutrient cycling	• The presence of extensive areas of cultivation encourages soil organic matter loss and makes soils prone to erosion. • Use of compost, mulching, and minimum-till methods will help maintain soil organic matter and improve soil structure and the ability of the soil to resist erosion.

sustainable environmental management through VNRMCs as the value of benefits from their wetlands increases. Key challenges to address in furthering the success of the Striking a Balance approach include: a) scaling-up of the functional landscape approach so that whole valleys and catchments—not just isolated areas belonging to individual villages—are managed with the same Striking a Balance principles; b) increasing and diversifying wetland-based incomes through, bee-keeping, crafts, and improved market linkages so as to enhance the value gained from wetlands; c) managing land-use pressures as vegetable production and other enterprises based on wetlands grow so as to maintain a balance of land uses and avoid the collapse of wetland functions and production; d) empowering locally developed institutions, such as VNRMCs, so they are sustainable and not dependent on external intervention for their functioning.

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