Malawi Enterprise Zone Association

Striking a Balance (SAB): Maintaining Seasonal Wetlands & their Livelihood Contributions in central Southern Africa

TECHNICAL REPORT 1

Function Landscape Approach to Sustainable Wetland Management: Integrating Wetland and Catchment Management in Simlemba TA, Kasungu District, Malawi

Patrick Thawe
Natural Resources Coordinator, MALEZA

The SAB Project is implemented in Malawi and Zambia by Wetland Action, Self Help Africa, FAIR, MALEZA and NLWCCDP in collaboration with the University of Huddersfield

Simlemba, Malawi **July 2008**

The SAB project is a demonstration project of the Wetlands and Poverty Reduction Project of Wetlands International and it is carried out with financial support from Wetlands International under its Wetlands and Poverty Reduction Project financed by the Dutch Ministry of Foreign Affairs (DGIS).

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1. Introduction

1.1 Nature of the challenge

In recent years wetlands, both those which are permanent and those which are seasonal, have attracted attention in Malawi from farmers who have needed to increase their crop production and income. Farmers have been driven in this direction by the shortage of upslope land to farm, degradation of their existing upland fields and drought which has caused rain-fed crops to fail. In addition, policies from the government and NGOs have also directed farmers towards these areas, as the importance of "winter" farming to achieve food security has been increasingly recognised and resources provided to support this. Further, some well-to-do farmers have seen the use of wetlands as opportunities for developing new market crops, such as early maize and vegetables, and appropriate places for applying new technologies, such as treadle pumps.

Deforestation and degradation in upland fields and catchment, Simlemba Traditional Authority

Treadle pump and vegetable production in wetlands in Simlemba TA

However, there is concern that wetlands are fragile ecosystems and that intensive use will lead to their degradation and the loss of the various functions and services they provide (otherwise termed ecosystem services). These ecosystem services include provisioning services – such as cropping, grazing, fishing and plant collection,

regulating services – such as flood control and water infiltration, cultural services – such as biodiversity protection, and support services – nutrient and water cycling.

Ecosystem services in wetland, domestic water, reeds, crop cultivation and irrigation

As a result of this concern, there is a debate about how to use wetlands in a sustainable manner and how best to achieve a balance between their ecological / environmental functions (regulating, cultural and support) and their productive roles (provisioning services). This is a major challenge, especially because there is little technical support for wetland management from the various field staff who have limited training in this area and there is no indigenous experience of intensive wetland cultivation.

1.2 Striking a Balance (SAB)

This challenge of how to progress toward the sustainable and multiple use of wetlands in order to meet the various needs to communities and society as a whole, is the main objective of this Striking a Balance (SAB) project. This report is the first in a series technical documents which will lead to the development of extension material to support sustainable management of seasonal wetlands in central Southern Africa.

The SAB Project was a 30-month project (July 2006-December 2008) which sought to explore how to manage seasonal wetlands in Zambia and Malawi in a sustainable way. The project was initiated under the management of Wetland Action in partnership with Harvest Help (now Self Help Africa) and Find your Feet and funded by the Dutch government through Wetlands International. In Malawi the local partner NGO, Malawi Enterprise Zones Association (MALEZA), was responsible for field implementation of the project in the Simlemba TA in Kasungu District. This was linked to the on-going Simlemba Sustainable Rural Livelihoods Project (SSRLP). In Zambia, the North Luangwa Wildlife Conservation and Community Development Programme (NLWCCDP) has been responsible for implementing the SAB project in Mpika District, Northern Province. The SAB project has also involved policy support, advocacy and information sharing in both countries and with COMESA and SADC.

The overall aim of the SAB project is to reduce poverty among wetland-dependent communities in central Southern Africa, by supporting sustainable wetland management through a functional landscape and multiple use approach, including the development of community institutions to ensure sustainable use. The project seeks to achieve this aim through technical field trials, as described here, and policy dialogue.

2. Understanding how wetlands operate – catchments and valley linkages

A first step in moving toward sustainable wetland use is to understand how wetlands function. The key feature of wetlands is the presence of water at, or near, the surface of the land, either permanently or seasonally, and the way in which this affects the ecology and environmental functions of the wetland area and its surroundings.

A simple summary, which identifies the critical aspects of wetlands, stresses the importance of water inflow and water outflow, which affect the water table fluctuations above or near to the surface and in turn influence the ecology – the plants and the animals.

Beyond this, it is necessary to ask where does the water come from, where does it go to and how are those flows influenced by other aspects of the environment and the surroundings. This requires a landscape analysis, part of which is shown in Figure 1. Here it is clear that what is happening in the uplands, or catchments, around a wetland affects the way the water reaches the wetland from that much larger area. If there is good land use and land cover, with soil and water conservation measures in the catchment, the water will infiltrate into the soil and percolate down 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, the rainfall will runoff rapidly into the wetlands and valleys, creating flood surges which will do damage in the wetland and in the valleys downstream. They may even create gullies and destroy road bridges and other infrastructure.

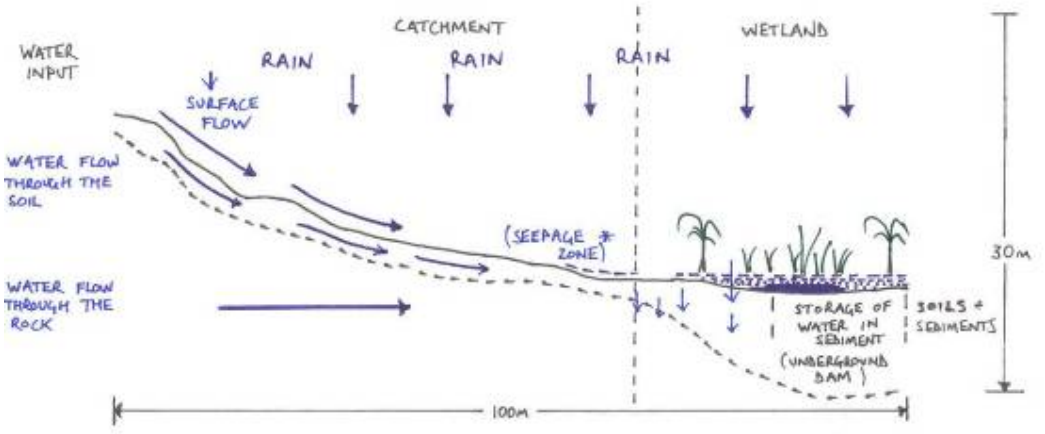


Figure 1: Water flows into valleys and wetlands

This rapid runoff from the catchment can also bring with it large amounts of eroded material which is deposited in the wetlands. Often it is the coarse material which is deposited in the wetlands reducing soil quality, while the finer sediments, 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 kilometres. As they do this, they lower the water table in a wetland and cause

wetlands to dry up, thereby reducing water storage in the wetland sediments which should supply shallow wells and help maintain downstream flows.

Gulley erosion in the centre of a wetland; natural vegetation protecting the centre of a wetland

Activities in wetlands also affect their sustainability. If all of the surface area of a wetland becomes altered for cultivation its ability to function as a wetland will be greatly reduced. This is especially so if drainage occurs and the water table is lowered. However, it will be less affected if the 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 more water from the wetland, especially when irrigation by watering can or by treadle pump is undertaken. As a result, the water table will be lowered.

Threats to wetlands: eucalyptus tree planting (left) and excessive cultivation of sugar cane

Some crops are especially dangerous for wetlands because they demand a lot of water and can even dry out wetlands completely. These include eucalyptus trees and sugar cane. For similar reasons the 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, compared to using cans filled from a well. In some cases use of pumps can lead to the drying up of domestic water sources, such as shallow wells.

Cultivation in the centre of a wetland can increase the chances of gulley 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 removed, the water flow can easily create a channel which can become a gulley. Gullies can lead to a lowering of

the water table, as mentioned above. In general the removal of natural vegetation to allow cultivation makes wetlands more prone to erosion.

Poor land use in a wetland and its catchment (as shown in diagram to right) leads to loss of water in a wetland. In the dry season the water table may be several metres below the surface – as shown above

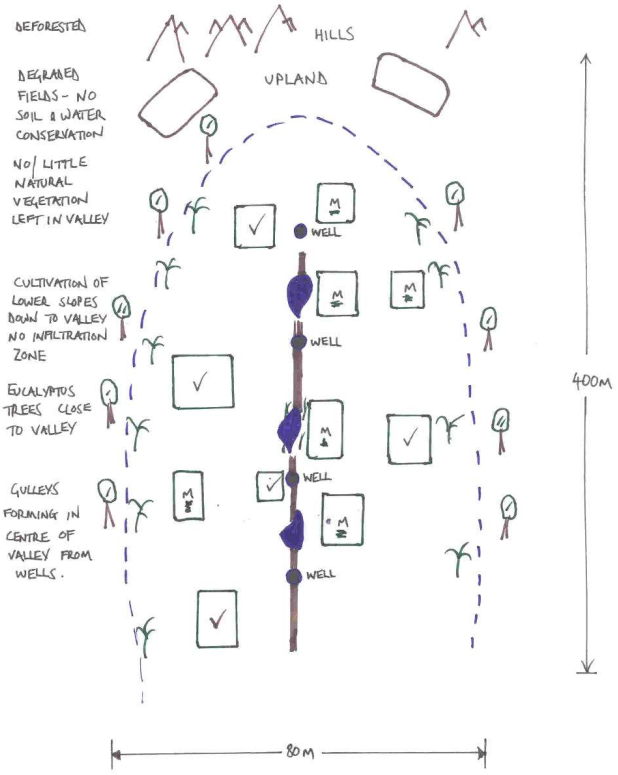


Figure 2: Degraded wetland and catchment – a dysfunctional landscape

Overall, there are serious dangers facing wetlands in Malawi, 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 through water storage, flood mitigation and nutrient cycling. Further, as wetland functioning is undermined, so too is the ability of these areas to provide provisioning services, especially cropping, as water tables are lowered and soils are affected by sediment deposition, erosion and changing water tables.

In this situation, the Striking a Balance Project is timely. In particular, it seeks to help communities understand how their wetlands operate, identify the best ways for achieving their sustainable use, and help people value wetlands so that they want to take actions to ensure their multiple benefits are sustained. Overall is seeks to "strike a balance" between the environmental and economic functions of wetlands to ensure sustainability and stresses the need for a functional landscape approach.

3. SAB approach to wetlands through the MALEZA sustainable livelihoods project in Simlemba Traditional Authority (TA)

3.1 Developing an Approach

The focus of the Simlemba Community Initiative for Sustainable Rural Livelihoods is to:

a) improve household food and nutrition security by practising sustainable utilisation of natural resources, including wetlands,
b) meet basic needs as a result of increasing income and assets derived from sustainable income generating enterprises, and
c) increase awareness of HIV/ AIDS and local capacity to cope with its negative impacts.

Wetlands were identified as a key natural resource because of the way Simlemba TA is prone to drought, suffers shortages of domestic water during the dry season, and has seen farmers increasingly focusing on wetlands for vegetable and dry season maize production.

One of the first initiatives of the project was to undertake a participatory assessment of the wetlands, and identify their value and the challenges faced in using them sustainably. This involved a study undertaken by several communities and MALEZA field staff, with facilitation from Wetland Action. The bulk of the material in that report came from the community's own experience and showed their considerable knowledge of the wetlands and their dynamics. The way to apply the lessons learned from this study clearly suggested the need for community-based natural resource management, with an integrated approach to addressing the catchments and wetlands together – as a functional landscape.

While the approach and planning was undertaken by the communities and the project in an integrated or holistic manner, it is possible to identify the specific elements. These are now outlined with an emphasis upon how they ensure the sustainable use of the wetlands to meet environmental functions (regulating and support services) and also agricultural production (provisioning services).

3.2 Upland Activities

The project activities in the traditional rain-fed farm land and other upland areas are discussed starting from the highest areas – the hills and rocky outcrops, followed by the main rain-fed farm fields and ending in the area bordering the wetlands.

a) Afforestation,

In order to improve infiltration of rainfall – which has positive effects on the wetland's water supply, and to reduce runoff and erosion – which generally have negative effects on the wetlands, afforestation of the upper slopes and hills beyond the farmland is being undertaken. In most cases indigenous species are used. These are raised in nurseries located near to wetland water sources, with the seeds sown in August into plastic tubes. The tree seedlings are planted out in January into prepared planting holes which are constructed in such a way that they catch rainfall and runoff. Spacing on the hilly sites is usually between one and two metres.

Afforestation activities: tree nursery, planting pits on hillside and firebreak

Other afforestation activities nearer to villages and homesteads are also encouraged to reduce the removal of natural vegetation for fuelwood or building poles. Woodlots are established near the villages for communal use and households also establish their own woodlots near to their homesteads. Firebreaks have been cleared by communities around their woodlots or protected natural woodland to prevent damage in the late dry season when fires are common.

b) Contour ridges and marker ridges

While much cultivation involves ridging in Malawi, the alignment of ridges is critical if water is to infiltrate and not run off. Ridges must follow the contours so that the rainfall remains in them and infiltrates, rather than running off and creating erosion. Marker ridges are carefully aligned using the tube method, and these provide the guidance for all ridges within 10 to 20 metres upslope or downslope.

c) Boxed ridges

Boxed ridges are being introduced in some areas to further improve the retention of water. These prevent the lateral movement of water along the furrows between ridges and help to ensure that water infiltrates where it has fallen. Contour and boxed ridges have multiple benefits as they not only improve infiltration and hence water availability for the field crops, but they also improve the deep infiltration of water which appears months or years later in the wetlands and shallow wells.

d) Organic compost making and use

To improve water infiltration, and also storage of water in the soil, increased use of organic fertiliser is recommended. This not only provides nutrients for plants but also helps improve the soil structure which allows water to enter and percolate through the soil more easily. Organic matter also holds water near to the roots to the crops and so helps them overcome drought periods.

e) Agro-forestry

Planting of agro-forestry trees and shrubs in the upland field is encouraged, especially where leguminous varieties can be used. Such shrubs and trees help stabilise the soil and reduce erosion risks. They also improve soil fertility from leaf litter and nitrogen fixing, while they also draw nutrients up from deep in the soil. Agro-forestry can also create benefits where fruit trees are grown and income can be obtained in this way.

f) Conservation farming

Minimum tillage methods of growing crops, along with the use of organic manure and agro-forestry species are also recommended for use in catchments as they reduce soil compaction, improve water infiltration and reduce carbon release.

g) Wetland edge protection zone

At the lower edge of the uplands, as they slope down to the wetlands, farmers are being encouraged to establish a zone of non-use in order to avoid sediment and overland water flow / runoff reaching the wetlands. Natural vegetation is protected from fire and encouraged to grow in this zone around each wetland.

3.3 Wetland Activities

a) Wetland zoning

One of the critical aspects of wetland use is the protection of the wetland centre / core and head from cultivation through the maintenance of natural vegetation and plants in these areas. This natural vegetation may be economically valuable if they include medicinal plants or provide relish and craft products. But in all cases they can provide a biodiversity reserve and natural habitat. The wetland core should be seen as an infiltration zone for replenishing the water in the wetland sediments and must not be allowed to turn into a drainage channel which could become a gulley – as discussed above.

Natural vegetation (mid picture) in the centre of two wetlands protecting the core

b) Location of Shallow Wells

Wells, whether for domestic water or for irrigation, should not be in the centre of the wetland as they can become focal points for gulley formation in this area where flood water flows fastest. It is preferable if the wells are nearer the wetland edge, even if this means they have to be a metre or so deeper.

Developing domestic water supplies from shallow wells, which rely on the recharge of wetlands sediments, helps increase the value which communities see in their wetlands. This encourages sound management of these areas and also the catchments which help supply the water.

c) Wetland cultivation techniques

Erosion risks: Wetland cultivation should not involve extensive clearance of natural vegetation. Where large areas are cleared there will be higher threats of erosion during the wet season when the wetland is flooded. A mosaic of small cultivated plots and natural vegetation helps to minimise erosion risks.

Beds for Cropping: Where cultivation occurs, small beds should be created. During the early part of the dry season when the water table is high these should be slightly raised to avoid water-logging, whereas in the later dry season they should be depressed below the surface to improve access to ground water and facilitate efficient use of irrigation water, avoiding loss through run off.

Lowered beds being used for cropping in a wetland toward the end of the dry season

Plant spacing: Plants should be spaced according to the recommendations for the different varieties so that good quality crops are produced. There may be plenty of water in wetlands at some times of year, but crowding will cause poorer quality produce which cannot fetch such good prices.

Compost use: To increase the efficiency of water use in the wetland beds and to improve soil structure so as to increase resistance to erosion, organic manure and compost should be used. Use of chemical fertilisers should be avoided as that can lead to increased acidity and the need for liming.

Mulching: Use of organic matter for mulching is also recommended to increase efficiency of water use in the hot season. However, mulches can create favourable conditions for some pests, so care is needed.

Water management techniques: Water should be regarded as a scarce resource and used with care. Treadle pumps should be used, where possible, to fill storage barrels from which irrigation can be done with care, rather than by distributing water all over the beds and neighbouring areas, as is often the case.

Wetland crops and plants: Where feasible the area of sugar cane should be reduced and the growing of eucalyptus in and around wetlands restricted, as both these plants draw large quantities of water from the wetlands. However, as these are both valuable crops a careful discussion and negotiation process is needed with sugar cane limited to especially wet sites and eucalyptus grown in upland areas.

3.4 Institutional Coordination and Village Land Use Planning

Critical to the management of catchments and wetlands is community coordination. Village Natural Resource Management Committees (VNRMC) are one way in which such coordination may be achieved. Through such institutions and the pressures which they can bring to bear upon individuals it is possible that activities and goals which benefit the majority of the people can be achieved, such as land use planning, afforestation, reduction of sugar cane areas and the better management of treadle pump water.

A VNRMC can help coordinate land use in the community's land, designating protection zones around wetlands and in the centre/core of the wetland. They can produce plans, such as that below, which identify the major activities needed to improve land use and the sustainable functioning of the landscape – including both catchments and wetlands. Such plans help communities see how the various activities above are linked and contribute to a functional landscape approach. This is an interactive process and all members of the community engage in it.

Landuse map showing afforestation, and soil and water conservation measures

3.5 Towards a Functional Landscape

The various measures outlined above, when applied together, can help improve the health of the wetlands by improving efficiency in water use, and water storage in both the wetlands and catchments. In fact this can be a win:win situation as crop production is improved and sustained in both the uplands and wetlands, while domestic water supplies improve and areas of biodiversity are protected in the wetlands, in the area bordering them and in the upper catchments. Hence those concerned with poverty reduction, livelihood development, hydrological management and biodiversity conservation can all buy into this. Overall a better functioning landscape is created with wide ranging sustainable benefits and greater resilience to climate change. The sort of land use pattern which may result is shown in Figure 3 below.

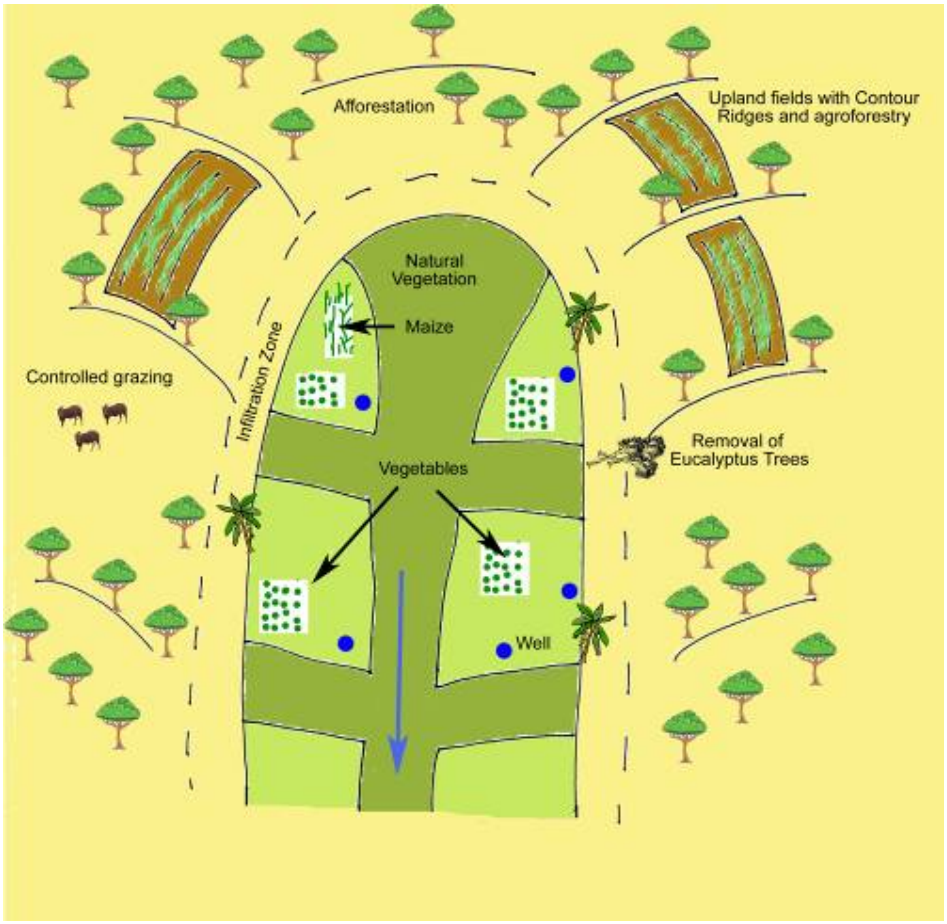


Figure 3: A land use plan for enhancing the functional landscape, linking catchments and wetlands

4. Progressing to a sustainable and functional landscape

While some progress has been made with all of the above measures in the three pilot communities in Simlemba TA, a number of issues remain to be addressed in order to achieve the maximum livelihood and environmental benefits from the functional landscape approach. Four key issues have been identified:

a) Scaling Up: A key challenge is how to scale up the functional landscape approach so that whole valleys and catchments, rather small parts of them, are managed in the same way. This means including other villages in adjoining areas of the catchment and wetland, as well as coordinating land use upstream and downstream. This is essential if the maximum effectiveness of the proposed interventions is to be achieved.

b) Increasing the value of wetlands: This includes improving the marketing of wetland produce to increase the income obtained from it. As people see increased benefits coming from the wetlands they will be encouraged to ensure good management.

c) Managing land use pressures: As population grows and the values of wetlands are recognised, there will be increased pressures on the VNRMCs to manage the demands for land and water for cultivation in the wetlands. Looking at how to maintain a balance of land uses to avoid the collapse of wetland functioning, and hence to maintain production, will be an increasingly challenging issue for the community institutions.

d) Diversifying wetland-based incomes: Achieving a balance of uses in wetlands will involve identifying other incomes which can be obtained from these areas and which encourage the maintenance of the natural vegetation and conditions. These may include activities such as fish ponds, bee keeping and crafts.

5. Livelihood benefits

One example of the way wetlands can benefit families comes from Katema village. This is one of the three Striking A Balance (SAB) demonstration sites in Simlemba TA. Samuel, 40 years old, is one of the farmers benefiting from the project. He started wetland production in 2001. The following are his views about the livelihood benefits from wetlands and the need to "strike a balance."

'I was not seriously into *dambo* production in the early years. The first reason was the shortage of water as our wetland went dry as early as September. The other reason was that I did not know that *dambos* could really improve somebody's livelihood. Even in 2001 it was the hunger, which forced me to start cultivating in the *dambo,* otherwise it could have taken me time.'

'I was only cultivating maize and beans from 2001 – 2005 and these were only for domestic consumption. Due to water problems I only cultivated once in a year and the yields were very poor. Hence that production was not able to take us far in terms of household food security. I was getting only two pails of maize and one pail of beans from 0.25 acres of land. This food could only last one month and thereafter the enemy (hunger) was back in our family.'

The SAB project came to Katema village in 2006. The farmers were trained in wetland management and utilization, and other things such as irrigation, water management, wetland protection and catchment management.

'In 2006 MALEZA trained us in wetland management and utilization. We learnt how we could conserve water in our wetland and how we could protect our wetland from being damaged (going dry). In addition to that, for the first time we were taught how we can construct beds in the wetland and how we can plant and manage crops. We were given seed like maize, onions, tomato, rape, mustard and Irish potatoes to start with. It seemed as if the MALEZA people were wasting their time. But I started changing the way I used to cultivate in the wetland and followed the new techniques, where water conservation was central. First, I was only interested in growing my usual maize and beans. My yields increased tremendously, from 2 pails to 3x50kg bags of maize and from a pail to 1x50kg bag of beans. So I tried other crops'.

Samuel's wife, Chancy, showing off tomatoes from their dimba garden.

With the steady availability of water in the Katema wetland Samuel increased the area which he cultivated by adding different crops. These included rape, tomato, onion and cabbage.

'My dearest crop is tomato. I make a lot of money by selling this crop. I am able to raise about MK50,000 (cUS$ 350) a year from selling tomatoes only. I bought a pig from the same money. I now have 3 pigs. I have also bought a radio at MK2700 and a cell phone at MK6000. I easily buy clothes and school uniform for my daughter, Queen. Food shortage in my household is no longer an issue. I did not know that there was such an easy way out of poverty. I am planning to buy more livestock especially cattle, build a nice house, boost my wife's bakery business and open a grocery shop. Before this project I did not know that wetland production could change somebody's life like this.'

'It is this moisture, which is important to me. I am very eager to protect the wetland. As you can see my plot is not close to the middle of the wetland because when you cultivate close to the middle of the wetland the flood water can destroy your plot. I conserve natural vegetation around my dambo plot because it keeps the moisture. I have started planting *Katope* (wetland trees) because they are very important in water conservation in the wetland.

Water is indeed life and there is life in the wetland' according to Samuel.

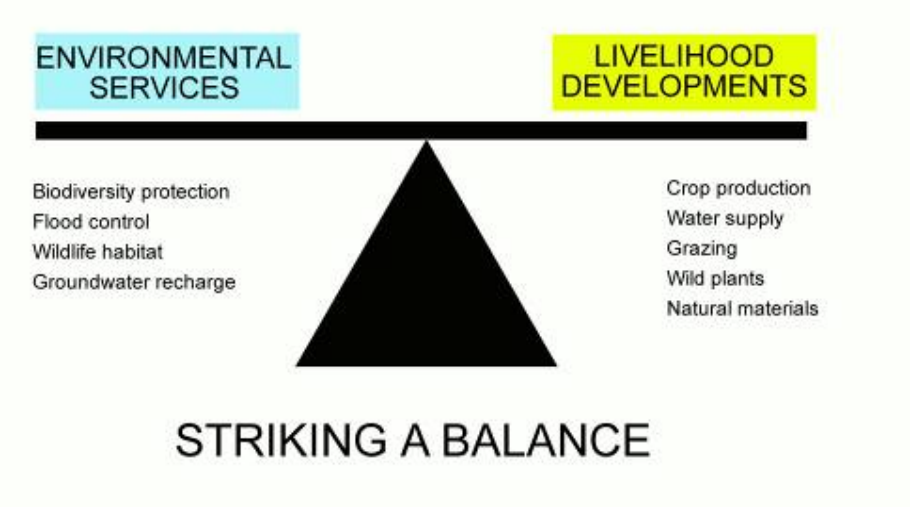
6. Conclusions

Wetlands are fragile resources but they cannot be ignored in the struggle to achieve the Millennium Development Goals, which include poverty reduction and sustainable environmental management. Rather than seeing wetlands only conserved for their biodiversity, or being over-developed for cropping till their production is undermined, a **balance has to be struck,** to ensure long-term sustainable use for both livelihoods and environmental functioning. The functional landscape approach, which is being tested in this project, has the potential to both improve livelihoods and also enhance

environmental functions of these areas. With good management wetlands can be sustained as sources of multiple livelihood benefits, as well as a range of critical environmental services.

SAB Project.

The SAB Project is one of four demonstration projects in Africa and Asia which are exploring how wetlands can contribute to poverty reduction. It is part of a global initiative on Wetlands and Poverty Reduction developed by Wetlands International and funded by the Netherlands Ministry of Foreign Affairs. The SAB Project is implemented in Malawi by MALEZA. The project was designed by MALEZA, Harvest Help, Find your Feet, FAIR and Wetland Action. Wetland Action has overall responsibility for the project to Wetlands International. The SAB Project included six field sites in Zambia and Malawi, policy support, advocacy and dissemination activities.



Acknowledgements:
Professor Adrian Wood, Wetland Action and Huddersfield University, for support in the production of this document.
Dr Alan Dixon, Wetland Action and Worcester University, for designing Figure 3 of this document and for advisory comments

For further details contact:

Patrick Thawe, Natural Resources Coordinator, MALEZA. Email: mwenecho@yahoo.com	Amos Zaindi, Malawi Country Director, Self Help Africa www.selfhelpafrica.org Email: amos.zaindi@selfhelpafrica.org	Prof Adrian Wood Director, Wetland Action. www.wetlandaction.org Email : a.p.wood@hud.ac.uk

Striking a Balance Publications

SAB Technical Reports

1. **Functional landscape approach to sustainable wetland management: integrating wetland and catchment management in Simlemba TA, Kasungu District, Malawi**
2. **Sustainable cultivation of "acid" *dambos*: experience from Mpika District, Northern Province, Zambia**
3. **Wetland institutions and sustainable management of natural resources: experiences in Zambia and Malawi**
4. **A baseline description of the ecological state and sustainability of use of three selected *dambos* in the Kasungu District, Malawi.**
5. **An assessment of the ecological sustainability of the use of three *dambos* in the Mpika District, Zambia.**

SAB Policy Briefing Notes

1. **Valuing wetlands for livelihoods as the basis for sustainable management – the SAB Approach**
2. **Local institutions and wetland management**
3. **Ecological assessment of wetland health to guide sustainable use**
4. **Wetland policies and policies for wetlands**

SAB Advocacy and Dissemination Reports

1. **Mpika District Workshop on Sustainable Wetland Management for Livelihoods Benefits and Environmental Functioning. (June, 2007)**
2. **Proceedings of a Lessons Learning and Advocacy Workshop, Lusaka, 5th August 2008. (November, 2008)**
3. **Proceedings of a Lessons Learning and Advocacy Workshop – Malawi, 24th July 2008. (November, 2008)**
4. **Kasungu District Workshop on Sustainable Wetland Management for Livelihoods Benefits and Environmental Functioning. (December 2008)**

SAB Field Assessment Reports

1. **Baseline PRA Report for Wetland Demonstration Sites, Simlemba Sustainable Rural Livelihoods Project, Kasungu District, Malawi**
2. **Overall Baseline Report for Wetland Demonstration Sites, Simlemba TA., Kasungu District, Malawi**
3. **Baseline PRA Report for Wetland Demonstration Sites, CHIMU Project, Mpika District, Zambia**
4. **Overall Baseline Report for Wetland Demonstration Sites, CHIMU Project, Mpika District, Zambia**
5. **Biodiversity assessment for three Mpika wetlands of the SAB Project**