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Sustainable Wetland Management for Food Security and Rural Livelihoods in South-west Ethiopia: the interaction of local knowledge and institutions, government policies and globalisation.

by
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Resume
Wetlands make important contributions to the rural communities in the highlands of south-west Ethiopia through their ecological functioning and the variety of economic products which they provide. At least since the 1920s some of the small valley head wetlands or the edges of larger wetland have been drained for dry season cultivation which has provided an important "hungry" season crop of maize before the main upslope harvest is available.

Ways of achieving wetland cultivation have been developed through local experimentation and in many cases this has allowed sustainable cultivation of parts of wetlands year after year for several decades with no major reductions in crop yields. Such sustainable cultivation is usually associated with mixed land use within a wetland with some areas reserved as swamp, while maintenance of a flooding regime is also important. Sustainable use is based on local knowledge of hydrology, soils and vegetation which has been built up over generations. From this has developed guidance for wetland management which has been implemented through local institutions and their by-laws.

Since the 1960s there have been a number of developments which have increased the demand for wetland cultivation. These include crop land shortage due to coffee expansion, land tenure changes and insecurity of access to wetlands, in-migration especially of famine victims from the north, food security policies which require local self-sufficiency, and the growth of urban centres which provide local markets for dry season food crops.

The increasingly intensive dry seasonal cultivation of wetlands does not necessarily build upon established good practice. In some communities wetlands are over-drained and degraded with these rich areas ending up as rough grazing land. Experience suggests that these cases of unsustainable use while partially due to external pressures which over-ride local knowledge, are also due to the failure of local experimentation and the dissemination of local knowledge of sustainable wetland management within communities.

The impacts of wetland degradation are considerable both in the wetland using communities and also in the surrounding and downstream communities. Half the springs in one district have dried up forcing women to walk further to collect water and impacting considerably on their workload and also family health. A shortage of wetland plants has impacted upon the supply of medicinal materials and craft industries which are important sources of rural income, especially when harvests are poor. Formerly communally accessed wetlands are being appropriated by a rural elite who have the resources to use them for agriculture while the rest of the community loose access to traditional benefits they have received from the wetlands.

This experience in the highland of south-west Ethiopia is that wetlands can be used sustainably if care is taken to manage the wetland in ways which maintain their wetland characteristics to a certain level – notably in terms of flooding regime. Serious dangers do exists in terms of wetland degradation if too much pressure for wetland cultivation is put upon rural communities and lessons from local experimentation are not recognised. While some external support to wetland cultivation is useful to prevent over-draining and degradation this must be linked into the local knowledge system rather than imposed from above. A full analysis of all the wetland stakeholders is also needed in order to develop use regimes which are both ecologically and socially sustainable, with local management arrangements supported across the whole community.

Gestion durable des zones marécageuses pour la sécurité alimentaire et la subsistance rural au Sud-ouest de l'Ethiopie: l'interaction entre la connaissance locale et les institutions, les politiques gouvernementales et la globalisation.

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Résumé
Les marais au plateau d'Ethiopie contribuent fortement à la subsistance des communautés locales par leur fonction écologique et la variété des produits économiques qu'ils apportent. Au moins depuis 1920 plusieurs petits marais situés en haut des vallées ou au bord des marais plus grands ont été drainés pour les cultiver pendant la saison sèche. Cette exploitation a permis de produire le maïs; une culture importante pour pallier la période de pénurie jusqu'à la récolte des cultures pluviales des collines/versants est disponible.

L'utilisation des zones marécageuses pour la production agricole a été achevée par l'expérimentation et une accumulation de la connaissance de l'hydraulique, des sols et de la végétation par des générations Cette expérimentation permettait à la population de cultiver des parties des marais de façon durable. Le plus souvent cette exploitation durable est associée avec un système d'utilisation des terres mixtes avec quelques zones réservées comme marais original pour préserver le système d'inondation.
L'expérimentation a abouti au développement des directions pour la gestion des zones marécageuses qui ont été utilisées par des institutions locales à travers l'implémentation des réglementations locales.

A partir de 1960 certains développements ont augmenté la pression pour cultiver les marais. Il s'agit le manque des terres arables à cause de l'expansion de la culture du café, le changement du régime foncier, l'insécurité d'accès aux zones marécageuses et l'immigration, surtout du Nord, des victimes des sécheresses. La politique de sécurité alimentaire qui demande une auto-suffisance locale, comme la croissance des centres urbains qui donne lieu aux marchés des cultures du saison sèche a contribué également à l'intensification de l'utilisation de ces sources.

Ce processus de la progression de l'utilisation intensive des marais pendant la saison sèche n'était pas nécessairement basé sur des bonnes pratiques acceptées généralement. Dans quelques communautés le sur-drainage du marais a abouti à une dégradation qui rend les marais aptes que pour l'utilisation comme pâturage. L'expérience suggère que cette exploitation néfaste soit due partiellement à la pression d'extérieur qui oblige à la communauté de négliger la connaissance locale. Partiellement l'expérimentation locale et la dissémination de connaissance locale sur la gestion durable des marais à l'intérieur de la communauté ne fonctionnent plus.

L'impact de la dégradation des marais est considérable pour les communautés qui utilisent les marais et pour ceux qui vivent autour et en aval des marais. Par exemple, le tarissement des sources hydraulique a obligé les femmes d'aller plus loin pour la recherche d'eau ; un alourdissement de ses taches et un impact considérable sur la santé familial. Le déficit des plants des marais a influencé la disponibilité du matériel médical et artisanal. Ce matériel est une source importante des revenus locaux, spécialement quand il y des récoltes pauvres. L'élite locale, qui a les moyens d'utiliser les marais pour l'agriculture, s'est appropriée ces marais autrefois caractérisés par un accès commun. Ainsi, le reste de la communauté a perdu l'accès aux bénéfices traditionnels des marais.

Cette expérience dans les plateaux de Sud-ouest d'Ethiopie montre que l'exploitation durable des marais est possible. Il faut maintenir certains caractéristiques du marais à un certain niveau ; surtout en ce qui concerne le système d'inondation. Les marais risquent d'être dégradés dans les zones avec une pression forte sur les communautés de cultiver les marais et dans les zones ou les leçons d'expérimentation ne sont plus reconnues.

L'assistance technique d'extérieur pour l'utilisation des marais pourrait prévenir le sur-drainage et la dégradation. Toutefois cette assistance devrait être liée au système de connaissance local plutôt que d'imposer des innovations du haut. En même temps l'analyse de tous les différents groupes d'utilisateurs est nécessaire pour le développement des systèmes d'utilisation qui sont durable du point de vue économique et écologique et qui ont le support de toute la communauté à travers l'implémentation des règlements de gestion locaux.

1. Introduction

This paper provides a summary of the experience of three years of research into the sustainable management of wetlands in south-west Ethiopia, an area which has a large number of valley head wetlands which are in many ways similar to those found in parts of Rwanda. The paper starts by explaining the origins of the research project and then outlines the methods which have been used in the research. The main focus of the paper is on the findings of the study with respect to the contribution of wetlands in maintaining food security and supporting rural livelihoods. The factors which influence this are several but a key element is the interaction between local knowledge and the government policies which threaten to undermine sustainable use of these areas.

2. Research Origins and Approach

This project originated from a number of field visits to the Illubabor highlands in the south-west of Ethiopia, during which the drainage of wetlands for cultivation was observed. Discussions with an international NGO revealed that they were encouraging this in order to reduce the pressure upon the forested areas and in order to help improve food security. At the same time, however, they were concerned that the sustainability of wetland cultivation was uncertain and that guidance was needed about drain density, drain depth and cultivation regimes (Wood, 1996). This concern was also evident among farmers and Ministry of Agriculture staff throughout the zone, who reported declining soil fertility and moisture availability following successive years of drainage and cultivation of wetlands.

In response to these concerns, the EU financed Ethiopian Wetlands Research Programme (EWRP)[2] was established in 1997 by the University of Huddersfield (HU) (UK) in collaboration with Addis Ababa University (AAU), and with technical support from IUCN's East African Regional Office and the University of East Anglia (UK) (Wood, 1996). EWRP started its field operations in Illubabor Zone of the Oromia Regional State in April 1997 and since then the programme has undertaken a range of research and implementation activities throughout the area.

The overall objective of this first phase of EWRP was:

> *"to contribute to the sustainable management of wetlands in Illubabor Zone, south-western Ethiopia"*
>
> (Wood 1996, p9)

Research activities centred on the fulfilment of several key objectives:

1. identification of the nature, extent and trends in wetland drainage and the use of wetlands,
2. assessment of the ecological impacts of different types of wetland use and drainage, including changes in hydrology, pedology and biodiversity,
3. identification and assessment of the local socio-economic processes which are leading to changing uses of wetlands,
4. identification of appropriate management practices which will ensure the sustainable use of the wetlands, building on the existing indigenous knowledge where appropriate,
5. dissemination of an understanding of wetland dynamics and sustainable management practices, and the support and development of local monitoring and management capacity, and
6. the contribution of material to debates, at national and regional levels in Ethiopia, and more widely, where policies which impact upon wetlands are discussed.

In fulfilling these objectives, EWRP adopted an innovative approach that brought together researchers from a range of disciplines such as economics, hydrology, biodiversity, indigenous knowledge, participatory methods and policy analysis among others, establishing a multi-disciplinary research team. In this way a wider, more holistic understanding of the various processes affecting wetland use and management was achieved during the three year period. According to IUCN, such an interdisciplinary approach to wetlands research was pioneering in the East Africa Region (Howard, 1997). Table 1 summarises EWRP's key activities, methods employed and data collected.

3. Findings and Experiences of wetlands research in southwest Ethiopia

3.1 Nature of Wetlands in the Illubabor Highlands

Illubabor Zone (Figure 1), which forms part of the south-west highlands of Ethiopia, consists of a moderately dissected plateau at an altitude of between 1600 m and 2000 m above sea level. The area has the highest rainfall in Ethiopia, up to 2000 mm over a ten month rainy season. The natural vegetation is tropical montane rainforest with an understorey which includes wild coffee (*Coffea arabica*) and some spices, notably cardamom (Afework Hailu, *et al.*, 2000).

The undulating plateau surface is underlain mainly by basalt rocks and is drained by an extensive network of streams and rivers which include wetlands at various points along their courses. These wetlands vary in size from less than 5 ha to over 400 ha, although small wetlands of less than 30 ha are by far the most common (Dixon, 2000). Spring-fed, valley-head swamps account for most of the small wetlands in the zone, although mid-valley swamps, which show hydrological similarities to larger floodplains, are also abundant. The sedge *Cyperus latifolius*, known locally as *cheffe* dominates all of the wetlands, while larger wetlands are also fringed by the swamp palm *Phonex reclinata*. The larger wetlands remain inundated for most of the year, while the smaller valley-head and mid-valley wetlands are inundated for varying lengths of time, usually for at least four months during the single rainy season from may to September (Dixon, 2000).

Illubabor zone is one of the more remote parts of Ethiopia, being some 450 - 700 km from Addis Ababa. Until the 1960s there was no all-weather road to this area and it was only in the 1970s and 1980s that two such roads were built traversing the zone from east to west and north to south. The area is relatively sparsely settled by Ethiopian standards (c60 persons / km^2) (MoA, 1998) and approximately a third of the surface is still forested. This forest is, however, increasingly being disturbed as a result of human use, notably for arable cultivation and coffee production under a thinned forest canopy. Illubabor can be seen as a resource frontier which to varying degrees has been brought into the economic life of the country since the 1950s, particularly as a result of coffee production and spice collection, but also through spontaneous in-migration, resettlement, and market-orientated smallholder agricultural development (Wood, 1977). As the population has increased, forest clearance for agriculture has taken place on the interfluves. Where land has become scarce, or where food shortages have occurred, especially in the early rainy season, the margins of wetlands and then the whole of some valley-head and mid-valley wetlands have been brought into cultivation for “green” maize (Tafesse Asres, 1996). Despite the market orientation of coffee production and some sales of cereals and vegetables to the urban market, the majority of the population in Illubabor are still primarily subsistence farmers with limited involvement in market-oriented activities.

Objective	Activities	Key Outputs and findings
1 - Nature extent and trends in wetland use	• Land use mapping, air photo interpretation and GIS mapping • Statistics collection • Interviews / PRA	• Changes in land use and wetland use identified • Trends in wetland use identified
2 - Identification of ecological impacts	• Hydrological monitoring • Soils monitoring • Vegetation monitoring • PRA - indigenous wetland knowledge	• Spatial and temporal impacts of drainage on hydrology • Impact of drainage on soil types identified • Biodiversity assessment with drainage
3 - Identification of socio-economic processes	• PRA sessions • Questionnaire survey	• History of wetland use • Identification of wealthy farmers as main wetland user group • Role of local institutions in wetland management
4 - Identification of appropriate management practices	• Field visits and case studies • PRA sessions	• Identification of good and bad wetland management scenarios • Importance of local knowledge, institutions and farmer co-operation. • Importance of mixed land use and flooding regime
5 - Training and dissemination	• Extension material development • Community exchange visits • Agricultural staff awareness raising and training workshops • Radio broadcasts • Poster and publication production	• Increased awareness of wetland issues within local government • Increased awareness at national level • Availability of extension and reference material
6 - Contribution to Policy debates	• Training and dissemination activities (above) • Networking	• Established National Wetlands Core Group • Wetlands on the agenda in other regions in Ethiopia • Publications

Table 1 - The key aims, methods and outputs of the Ethiopian Wetlands Research Programme.

Figure 1 - The location of Illubabor Zone in Ethiopia.

Highland areas (land above 1500m)

Source: Dixon (2000)

3.2 History of Wetland Use

The wetlands of Ethiopia's south-western highlands make important contributions to the livelihoods of rural communities. Environmentally, they provide a range of hydrological and ecological benefits including the recharge and discharge of groundwater, flood control and sediment retention, as well as supporting a high biodiversity of specially adapted flora and fauna. In their natural state the wetlands also provide a range of socio-economic benefits (Table 2) the most important of which is arguably the provision of clean water supplies throughout the year. *Cheffe* is also harvested from the wetlands and used by communities as a roofing and craft material, whilst other plants are collected and used for medicinal purposes by wetland communities. For example, the plant known locally as *balawarante* (*Hygrophila auriculata*) is used as a treatment for various skin diseases whilst *busuke* (unknown) is used as an enrichment in children's food (Zerihun Woldu and Kumelachew Yeshitela, 1998).

Table 2 - Wetlands and their beneficiaries in Illubabor Zone.

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

Source: (Wood *et al*., 1998)

As reservoirs of moisture during dry periods, these wetlands are also attractive agricultural resources and many have been used in the past, albeit on a small, informal scale, to cultivate maize much earlier in the season than on the uplands (Tafesse Asres, 1996; Wood, 1996). This practice, which includes the majority of the wetland maize crop being harvested before maturation, i.e. during its 'green' phase, facilitates the production of crops during a period of the year normally associated with food shortages. During the last 100 years, however, it appears that wetland cultivation has extended dramatically to include larger areas of wetlands and in many cases whole wetlands have been drained and cultivated. Currently the complete drainage and cultivation of wetlands is a common phenomenon throughout several zones in South-west Ethiopia, notably Wellega, Illubabor and Jimma.

Although it is difficult to trace the origins of wetland drainage and cultivation in the region, most wetland farmers suggest that the drainage of whole wetlands dates back to the early 20th century. In other parts of the south-western highlands there are indications that wetland agriculture has been a feature of the landscape since the 19th and perhaps even the 18th Century (McCann, 1995). In most cases there is consensus among wetland farmers that wetland drainage and cultivation was originally initiated in response to food shortages on the uplands caused particularly by drought, which is common even in this well watered part of Ethiopia (Pankhurst, 1985; Dessalegn Rahmato, 1991; UNDP, 1999). Rather than the farmers themselves initiating wetland agriculture in Illubabor, however, it appears that the feudal landowners between the Menelik and Haile Selassie eras (1913-1974) and the agricultural policies of the Derg[3] regime (1974 – 1991) and current Federal Democratic Government (1991 - present) have had more of a direct influence on bringing land into cultivation (Taye Mengistae, 1990; Alemneh Dejene, 1990; Afework Hailu et al., 2000a; Wood, 2000). For example, farmers at one wetland in central Illubabor described how the governor of Illubabor between 1911 and 1918, *Dejazmach* Ganame, instructed the landlords in their district to begin cultivating wetlands as a result of food shortages throughout the zone (Tegegne Sishaw, 1998). In addition, there is evidence elsewhere to suggest that farmers also applied to landlords for permission to cultivate wetlands (Dixon, 2000).

3.3 Indigenous Knowledge and Sustainable Wetland Use

Despite a move away from the traditional cultivation of wetland margins during the last 100 years, the extension of wetland agriculture to include whole wetlands is evidently sustainable in many areas. The findings of participatory research carried out by EWRP suggests that the

practices of wetland drainage and cultivation have developed and evolved over time as a result of local experimentation and the dissemination of wetland knowledge between communities (Afework Hailu *et al.*, 2000b; Dixon, 2000). Wetland farmers have clearly made modifications to their wetland management system in response to environmental and socio-economic changes and through this constant process of adaptation, the sustainability of wetland resources and their associated functions and benefits are ensured. In one wetland for example, farmers have developed and implemented a system of mixed land use for approximately 80 years, in which cultivated wetland plots exist alongside areas of natural vegetation. According to farmers, the natural vegetation acts as a reservoir of water which is slowly released during dry periods, thereby ensuring adequate soil moisture conditions for sustainable crop production. Farmers also consider the restoration of the natural flooding regime at the end of each growing period as a critical means of regenerating soil fertility and soil moisture levels.

Farmers also use wetland plants as indicators of changes in soil fertility or hydrological conditions. For example, The plant *kemete* (*Leersia hexandra*) is associated with the degradation of wetlands. If this starts to colonise the wetland, farmers will realise that they need to actively restore the normal flooding regime in order to increase the fertility of the wetland. Similarly the plant *inchinne* (*Triumfetta pilosa*) is used as an indicator of increasing fertility, hence its appearance in a wetland is often regarded by farmers as the end of a fallow period. Indigenous knowledge of these plant indicators represents a critical way in which the local community can assess the state of their wetland and take appropriate action to ensure wetland use is sustained.

The sustainability of wetland management is also facilitated in many areas by the presence of local institutions specifically formed to co-ordinate and empower wetland management activities. Whilst most are relatively recent, being associated with the expansion of wetland cultivation since the 1960s, investigations have shown that there are traditional institutions for wetland management in some parts of Illubabor which have long histories. In the Tulla system of community administration developed by the Oromo after they invaded the area in the 17th century, one of the community elders was an 'Abba Laga', or 'father of the water'. This person was traditionally responsible for co-ordinating the use of the wetlands for a variety of purposes including drainage agriculture. He had powers to organise drainage and guarding, but could also remove farmers from the wetlands if they were not farming in an appropriate manner (Afework Hailu, 1998; Abbot *et al*., 2000).

Since the 1975 Land Reform Proclamation natural resource management has been the responsibility of the community administration, initially the Peasant Associations established by the Derg and since the mid 1990s the Kebeles and Sub-Kebeles (Shennies) which have replaced them under the present government. Formal or informal groups, sometimes sub-committees of these institutions, have developed as wetland management co-ordinating committees, to continue the work of the 'abba laga'. They have formulated local regulations on a number of aspects of wetland use including:

- restrictions on agricultural expansion in wetlands in order to protect areas for sedge production and dry season grazing,
- controls to prevent over-drainage which will impact upon crop cultivation directly through lack of water and indirectly through soil changes,
- limits on sedge cutting and drainage in order to maintain the quality and supply of sedges,
- co-ordination of drainage in order to make this work more efficient and effective,

- co-ordination of guarding in order to protect the wetland crops, and
- resolving of wetland management disputes where farmers fail to complete tasks, such as drainage, allocated to them.

Clearly wetland cultivation has stimulated considerable institutional development by local communities, both in terms of group formation and in terms of by-laws based on farmers' perceived needs.

3.4 Pressures upon Wetlands

Since the 1960s there have been a number of developments which have increased the demand for wetland use. Wetland cultivation has long been regarded as a way of releasing land on the uplands or interfluves for coffee cultivation and following the 1984 drought and famine in the north of the country, the Derg introduced a policy which required all regions of the country to become self-sufficient in food, even if, as in Illubabor, cash crop surpluses (coffee) were used to "import" grain from surplus regions. In the north this policy was linked to micro-irrigation but in the well watered south-west highlands this was inappropriate and an alternative policy had to be developed (Kloos, 1991). With forest land officially subject to protection by the Peasant Associations and also by the Ministry of Tea and Coffee Development, the wetlands seemed to be one land resource which could be developed without attracting criticism. More important, however, was the fact that food can be produced from wetlands in the 'hungry' season, which precedes the normal harvest, and during which grain prices are high. Hence drainage, rather than irrigation became the technology encouraged by the agricultural department in this area to meet their responsibilities towards the national policy (Wood, 1999). Indeed, wetland cultivation is still seen as a contributor to the search for food security after a poor harvest, and on such occasions the regional administration sets up a Wetland Task Force in each district to encourage cultivation in the following dry season (Afework Hailu, 1998). Such a government response was evident following the prolonged dry season of 1999, with wetland cultivation increasing dramatically during 2000.

Since coffee remains an important source of foreign exchange for Ethiopia, there have been continuing efforts to increase production through a variety of government measures and projects. One policy pursued in the south-west since the 1960s has been to encourage farmers to plant coffee in the forest near to their cleared farm land. This restricts the "normal" expansion of cultivation by forest clearance as the population grows and as soil fertility declines on established fields. In order to overcome this problem some farmers have resorted to wetland drainage to provide alternative land for food cultivation (Wood, 1996).

A number of other Derg policies put particular pressure upon the wetlands. Following the 1984 famine the government decided to resettle half a million people from the north of the country to the better watered areas in the south (Alemneh Dejene, 1990). In Illubabor integrated resettlement was practised, whereby settlers were linked to established communities who were expected to allocate them land and also provide some support to ensure their survival. Sometimes the established communities allocated wetlands to the settlers as these lands were less valuable than the alternative forest margins near to their existing fields. As a result wetland cultivation increased during the late 1980s, although much of this has been abandoned with the return north of many settlers following the change of government in 1991.

In the late 1980s, the process of villagisation, through which the Derg regime tried to concentrate the dispersed rural population into villages, also had impacts upon wetlands. This policy created new concentrated settlements in areas where previously farmers had lived separately on their farms (Alemneh Dejene, 1990). The sudden need to replace most of the homesteads led to a major demand for building materials, including *cheffe*. This created intense pressure upon the wetlands nearest to the sites of the new villages and many sedge beds were seriously reduced in quality for a number of years. In other cases the relocation of people away from wetlands led to a decline in wetland cultivation as the distance to travel to these plots became excessive and their isolation made them difficult to guard.

Government agricultural development policies have also affected wetland use in a variety of ways. The introduction, during the late 1960s, of new short season maize varieties from Kenya made the cultivation of wetlands much easier with the earlier maturation of the maize improving the chance of a harvest before the flood rose too high and killed the maize (McCann, 1995).

3.5 The Degradation of Wetlands

Whilst wetland management has remained sustainable in many areas, in others the pressures outlined above appear to have precipitated a shift from sustainable to unsustainable management, characterised by the degradation of wetlands and their resources. The need to increase agricultural output from wetlands has lead in some cases to the complete cultivation of whole wetlands with two crops per year rather than one becoming the norm. Without the temporary restoration of the natural flooding regime each season, there are indications that the soil fertility of double-cropped wetlands is rapidly exhausted and within several years the water table falls to a level where it cannot continue to support agriculture. Although farmers acknowledge the detrimental effects of double-cropping with crops such as sugar cane and tef, in addition to maize, the need for food security is often their priority**.**

With a decline in water table levels, the ecological characteristics of the wetlands change dramatically, hence the availability of natural vegetation as well as clean water declines, with obvious implications for the livelihoods of local communities. Under these conditions, many wetlands in Illubabor are used as grazing grounds for cattle although this is often a short-lived benefit as the trampling action of cattle aids the process of soil compaction, mineralisation and erosion (Afework Hailu *et al.*, 2000b).

The degradation of wetlands in this manner and the associated loss of functions and benefits can have dramatic effects on local communities. In one district of central Illubabor half the springs have dried up forcing women to walk further to collect water and impacting considerably on their workload and also family health (Wood, in press). A shortage of wetland plants has impacted upon the supply of medicinal materials and craft industries which are important sources of rural income, especially when harvests are poor. Further impacts include the increased variation in river flow in the region which has implications for the production of hydro-power from downstream barrages.

Experience suggests that many of these cases of unsustainable use while partially due to external pressures which over-ride local knowledge, are also due to the failure of local experimentation and the dissemination of local knowledge of sustainable wetland management within communities. Discussions with farmers in some communities revealed that examples of innovation and the communication of wetland knowledge between farmers and between different wetland communities were relatively rare. In effect, the mechanisms

through which new knowledge is acquired and wetland management practices evolve appear under-developed or under-utilised. Under circumstances where farmer co-operation, communication and the opportunities for innovation are plentiful, wetland management arguably has a greater potential to be both successful and sustainable. Hence this indigenous capacity characterised by a dynamic and evolving indigenous knowledge system, can be considered a prerequisite to the evolution of wetland management practices and consequently sustainable wetland management itself.

3.6 The Search for Sustainable Use

As suggested in Section 3.2, sustainable wetland use is being maintained in some areas despite increasing pressures, and farming innovations and adaptations which prevent degradation are taking place. A major part of EWRP's research activity in the area has been concerned with identifying the wide range of management practices, the nature and dynamics of the knowledge on which these are based and the institutional arrangements which facilitate sustainable wetland management strategies. As a result, EWRP has been able to draw attention to a number of principles and practices which can be considered important components of sustainable wetland management.

In terms of wetland management practices, the maintenance of the wetland water balance is fundamental in ensuring that the wetlands do not dry up and thereby lose their functions and benefits which rely on their ecological and hydrological characteristics. Maintenance of the water table alongside wetland agricultural use can be achieved in a number of ways:

1. By maintaining areas of natural *cheffe* vegetation in the wetlands, which promote and sustains natural hydrological regimes, aid the trapping of fertile sediment from the catchment and provide a critically important raw structural material for local communities. Of particular benefit is the reservation of areas of *cheffe* vegetation both at the head / inflow of the wetland and the outflow.
2. By ensuring drainage and cultivation is carried out in a non-destructive manner, in particular by:
   - adapting drainage networks to the spatial variability in the hydrological regime (avoiding over-drainage or under-drainage),
   - adapting drainage practices to temporal changes in hydrometeorological conditions, e.g. through ditch blocking or clearing so that the soil moisture conditions for crop production are optimised throughout the growing season,
   - avoiding the cultivation of two consecutive crops during one year, hence allowing a period of regeneration following the main growing season,
   - farmers monitoring the effects of their drainage and cultivation activities and making modifications where necessary.
3. By facilitating the natural flooding of the wetland during the wet season for as long as possible. This replenishes the wetland water table whilst also allowing soil fertility and soil structure to recover.

In addition, several key soil management practices which can help minimise degradation and nutrient loss were also identified:

1. Restricting the access of cattle to wetlands avoids soil compaction and erosion.
2. Double-cropping, which rapidly exhausts soil fertility, should be avoided.
3. The promotion of soil conservation measures (e.g. ensuring the correct ploughing depth and manuring).

The practices outlined above are by no means new or innovative. Most farmers involved in wetland cultivation understand well the advantages of these practices and implement them to the best of their ability. More often than not, however, the adoption or non-adoption of these practices ultimately depends on the individual's socio-economic circumstances, i.e. the resources available to them, and as mentioned previously, the state of their indigenous knowledge system. Consequently, the research experience in Illubabor suggests that a fundamental principle for sustainable wetland management should be the achievement of a state of social sustainability within local communities. In other words, communities should possess the capacity to innovate and adapt their natural resource management practices in response to socio-economic, political and environmental pressures so that they continue to be sustainable. Local natural resource management institutions in particular, have a key role to play in supporting and empowering the application of sustainable management practices.

Whilst some external support to wetland cultivation is useful to prevent over-draining and degradation this must be linked into the local knowledge system rather than imposed from above. The role of the outsider should predominantly be that of a facilitator who brings together local communities and other wetland stakeholders, encouraging the exchange of knowledge and experiences, and assisting in any analysis of strengths and weaknesses in management strategies and policies. Through this empowerment of a range of wetland stakeholders and institutions, the potential for self-supporting, sustainable wetland management strategies are greatly enhanced.

4. Using the Findings

A key element of this research programme has been the dissemination of the findings among all the stakeholders. Participatory Rural Appraisal sessions, farmer exchange visits and community workshops facilitating the exchange of wetland knowledge and experiences have involved over 1500 community members in Illubabor Zone. Community developed extension material has been circulated among communities, agricultural staff and policy makers and this continues be tried and tested in the field.

A number of initiatives have specifically targeted wetland policy makers and development workers in the country, in particular national and regional workshops have been undertaken in which extension material and policy briefing notes have been developed. Partly as a result of this work there has been a national workshop on wetlands which has formed a National Wetland Core Group which is trying to raise the level of awareness of wetlands amongst policy makers. This has been facilitated by the project's policy briefing notes which have been used in various ways, including reproduction in the newsletter of the Conservation Strategy of Ethiopia, to raise awareness about wetlands. Some other regions of the country have also started their own wetland assessment procedures (Dixon *et al.*, 2001) and in two regions assistance is being given by the Ethio Wetlands and Natural Resources Association[4], a local NGO which developed out of the research programme.

5. Lessons for Wider Application

Whilst the research programme concentrated on specific wetlands in one part of Ethiopia, many of its findings and experiences are evidently transferable to other areas. The key lesson to be identified is that wetlands are critical yet fragile resources which must be carefully managed if their range of functions and benefits are to be maintained. The multiple use of wetlands which balances conservation with development is one means of maintaining a wide range of socio-economic benefits alongside those linked to wetlands' natural hydrological and ecological functioning. The alternative extremes of conservation or conversion in total to

agriculture can have devastating effects on rural livelihoods. Conservation leads to loss of access to land for 'hungry' season cultivation, while total conversion leads to the loss of natural products and hydrological functions.

Secondly, the importance of indigenous knowledge and local institutional capacity in wetland management should not be underestimated. Communities and individuals possess extensive knowledge of their specific environments and some have been applying sustainable management practices for generations. Whilst their capacity to continue to manage wetlands sustainably may suffer during periods of rapid socio-economic or political change, the challenge is to address these problems and empower local communities to develop their own socially sustainable solutions. Management initiatives should aim to build upon and enhance local capacity and the body of existing knowledge at all times.

Thirdly, there is a need for all wetland stakeholders to participate in any wetland planning or management initiative. Wetlands are trans-boundary resources and their management has implications for communities upstream and downstream as well as policy making at the local, district and national level. It is critical that attention is paid to the specific interests of all groups so that wetlands can provide the maximum benefit to all.

Finally, on the basis of EWRP's experience, it can be argued that research should be the first stage in any programme of wetland policy making or management implementation. In particular, research should be participatory and holistic in nature. It should involve a wide range of stakeholders and be sensitive to the various inter-relationships between wetlands and their catchment, vegetation and hydrology, household socio-economics and wetland land use among other variables. In addition, a wider scientific understanding of the role and significance of wetlands can complement and enhance indigenous knowledge thereby significantly increasing the opportunities for the development of sustainable wetland management strategies and rural livelihood security.

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3. The government of Ethiopia between 1974 and 1991 in which power was initially shared by a military committee and later centralised into the hands of President Mengistu Haile Mariam.

4. Ethio Wetlands and Natural Resources Association (EWNRA) is a local NGO which specialises in addressing issues related to wetlands and their catchments. Its main work is in awareness creation and training to support communities and their local institutions in the sustainable management and rehabilitation of wetlands. EWNRA can be contacted through email: ewrp@telecom.net.et
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